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RF TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
T5

REPORT NUMBER:
210400137SHA-001

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TEST REPORT

Report no.: 210400137SHA-001

Applicant:	Keenon Robotics Co., Ltd. 11F, Building 56, No. 1000, Jinhai Road, Pudong District, Shanghai,China
Manufacturer:	Keenon Robotics Co., Ltd. 11F, Building 56, No. 1000, Jinhai Road, Pudong District, Shanghai,China
FCC ID:	2AZLQ-T5
IC:	27189-T5

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2019): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (April 2018)+A1(March 2019): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
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Project Engineer Teddy Yin	Reviewer Daniel Zhao

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Content

REVISION HISTORY **5**

MEASUREMENT RESULT SUMMARY **6**

1 GENERAL INFORMATION **7**

1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) 7
1.2 TECHNICAL SPECIFICATION 7
1.3 DESCRIPTION OF TEST FACILITY 9

2 TEST SPECIFICATIONS **10**

2.1 STANDARDS OR SPECIFICATION 10
2.2 MODE OF OPERATION DURING THE TEST 10
2.3 TEST SOFTWARE LIST 11
2.4 TEST PERIPHERALS LIST 11
2.5 TEST ENVIRONMENT CONDITION: 11
2.6 INSTRUMENT LIST 12
2.7 MEASUREMENT UNCERTAINTY 13

3 MINIMUM 6DB BANDWIDTH **14**

3.1 LIMIT 14
3.2 MEASUREMENT PROCEDURE 14
3.3 TEST CONFIGURATION 14
3.4 TEST RESULTS OF MINIMUM 6DB BANDWIDTH 14

4 MAXIMUM CONDUCTED OUTPUT POWER AND E.I.R.P. **15**

4.1 LIMIT 15
4.2 MEASUREMENT PROCEDURE 15
4.3 TEST CONFIGURATION 15
4.4 TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER 15

5 POWER SPECTRUM DENSITY **16**

5.1 LIMIT 16
5.2 MEASUREMENT PROCEDURE 16
5.3 TEST CONFIGURATION 17
5.4 TEST RESULTS OF POWER SPECTRUM DENSITY 17

6 EMISSION OUTSIDE THE FREQUENCY BAND **18**

6.1 LIMIT 18
6.2 MEASUREMENT PROCEDURE 18
6.3 TEST CONFIGURATION 19
6.4 THE RESULTS OF EMISSION OUTSIDE THE FREQUENCY BAND 19

7 RADIATED EMISSIONS IN RESTRICTED FREQUENCY BANDS **20**

7.1 LIMIT 20
7.2 MEASUREMENT PROCEDURE 20
7.3 TEST CONFIGURATION 22
7.4 TEST RESULTS OF RADIATED EMISSIONS 24

8 POWER LINE CONDUCTED EMISSION **29**

8.1 LIMIT 29
8.2 TEST CONFIGURATION 29
8.3 MEASUREMENT PROCEDURE 30

8.4 TEST RESULTS OF POWER LINE CONDUCTED EMISSION 31

9 OCCUPIED BANDWIDTH 35

9.1 LIMIT 35
9.2 MEASUREMENT PROCEDURE 35
9.3 TEST CONFIGURATION 35
9.4 THE RESULTS OF OCCUPIED BANDWIDTH 35

10 ANTENNA REQUIREMENT 36

APPENDIX A: TEST RESULTS 37

Revision History

Report No.	Version	Description	Issued Date
210400137SHA-001	Rev. 01	Initial issue of report	Aug 27, 2021

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 2 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 2 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 2 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.6	Tested
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable
2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.
3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Delivery Robot
Type/Model/PMN/HVIN:	T5
Description of EUT:	EUT is a Delivery Robot and has only one mode. EUT supports WIFI function.
Rating:	DC48V Docking Station: C1 Input: 100-240V~, 50/60Hz, 2.5A Output: 54.6VDC, 3A Charger:BC254480030 Input:100-240V~, 50/60Hz, 2.5A Output:54.6VDC, 3A
EUT type:	☐ Table top ☒ Floor standing
Software Version:	V1.2
Hardware Version:	V3.10.0
Sample No.:	0210219-07-003
Sample received date:	Feb 20, 2021
Date of test:	Feb 21~Jul 20, 2021

1.2 Technical Specification

Frequency Range:	2412MHz ~ 2462MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
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) IEEE 802.11n-HT40: OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20) 7 Channels for 802.11n(HT40)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Channel Separation:	5 MHz

1.3 Antenna information

Antenna No.	Model	Antenna type	Antenna Gain	Note
1	/	PIFA antenna	3.0	

Mode	Tx/Rx Function	Beamforming function	CDD function
802.11b	1Tx/1Rx	NO	NO
802.11g	1Tx/1Rx	NO	NO
802.11n(HT20)	1Tx/1Rx	NO	NO
802.11n(HT40)	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: CN0175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2019)
ANSI C63.10 (2013)
KDB 558074 D01(v05r02)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (April 2018)+A1(March 2019)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
SecureCRT	/	/	Manufacturer

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

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462
	802.11n(HT40)	2422	2437	2452

Data rate VS Power:

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
2400-2483.5	802.11b	1Mbps
	802.11g	6Mbps
	802.11n(HT20)	MCS0
	802.11n(HT40)	MCS0

The EUT will use two types antenna, and there have the following test mode:
Radiated test mode:
Mode 1: EUT transmitted signal with internal antenna;
Conducted test mode:
Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;
We have verified all test modes, and choose the worst mode 1 for radiated test and mode 2 for conducted test as representatively to list the results in this report.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	HP ProBook 6470b	100-240V AC, 50/60Hz

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	25°C	55% 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	25°C	55% RH
Power line conducted emission	25°C	55% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2022-07-15
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2021-11-30
☒	Shielded room	Zhongyu	-	EC 2838	2022-01-07
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2021-09-16
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2021-09-24
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2022-06-11
☒	Horn antenna	R&S	HF 906	EC 3049	2022-01-17
☒	Semi-anechoic chamber	Albatross	-	EC 3048	2021-07-31
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2022-03-16
☒	Coaxial cable	ETS	/	/	2022-03-16
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2022-01-05
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2022-01-05

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	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Occupied Channel Bandwidth	± 0.88 %
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

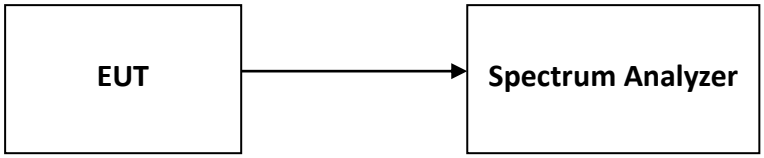
3.1 Limit

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

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

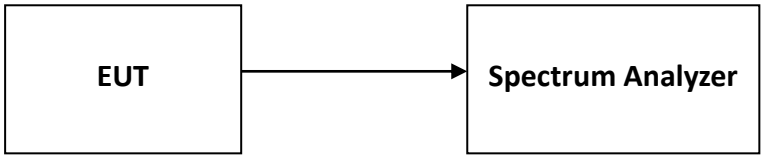
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

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 DTS test procedure of “KDB558074 D01v05r02 15.247 Meas Guidance” (clause 8.3.2.2) for compliance requirements.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

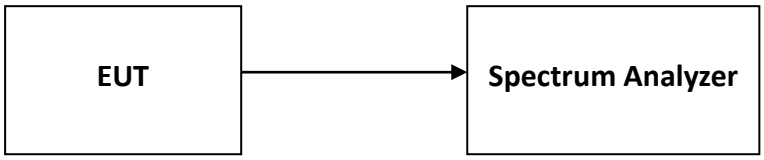
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

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

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
a) Measure the duty cycle (D) of the transmitter output signal as described in 11.6.
b) Set instrument center frequency to DTS channel center frequency.
c) Set the instrument span to 1.5 times the OBW.
d) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set the VBW ≥ 3 × RBW.
f) Detector = power average (rms).
g) Ensure that the number of measurement points in the sweep ≥ 2 × span / RBW.
h) Manually set the sweep time to: ≥ 10 × (number of measurement points in sweep) × (total ON/OFF period of the transmitted signal).
i) Do not use sweep triggering. Allow sweep to “free run.”
j) Perform the measurement over a single sweep.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add [10 log (1 / D)], where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time.
m) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

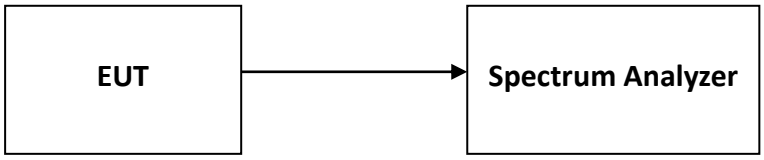
6.2 Measurement Procedure

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

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (0.1 meters for floor-standing device) above the ground at a 3 meter 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, the lowest height of the magnetic antenna was 1 m above the ground.
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) or 0.1 meters (for floor-standing device) above the ground at 3 meter 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.

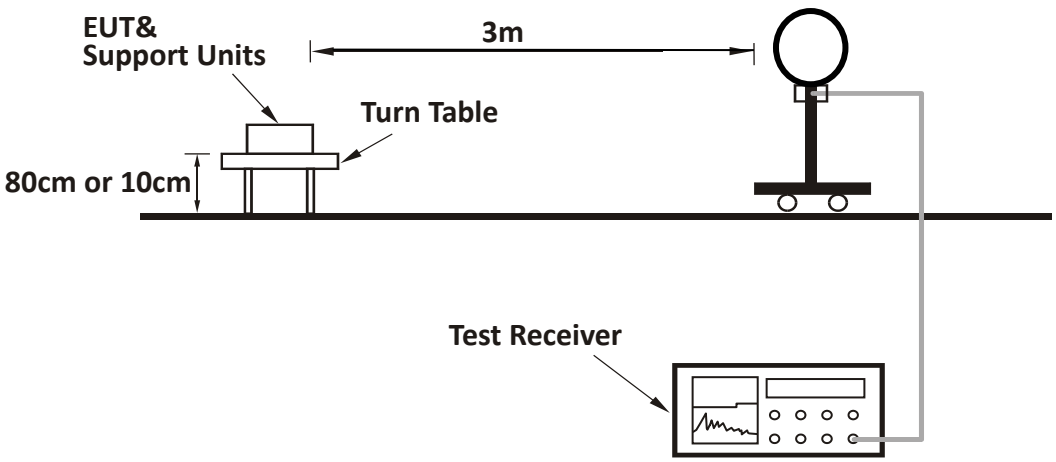
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

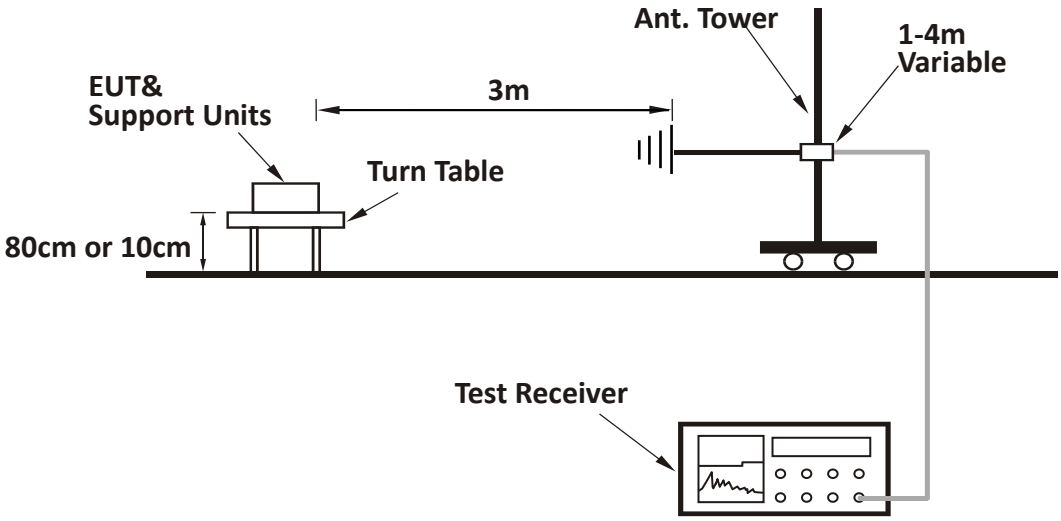
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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 are reported

7.3 Test Configuration

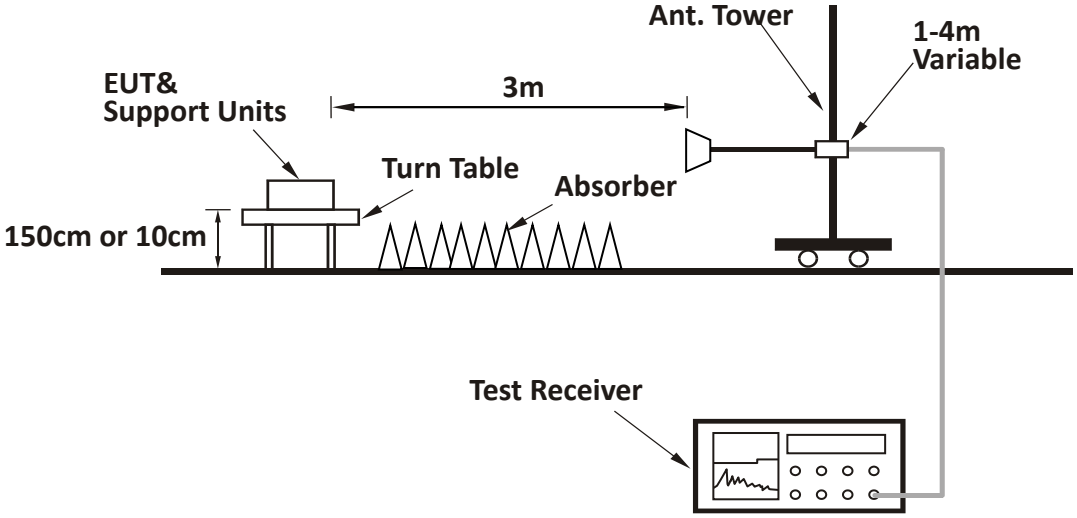
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

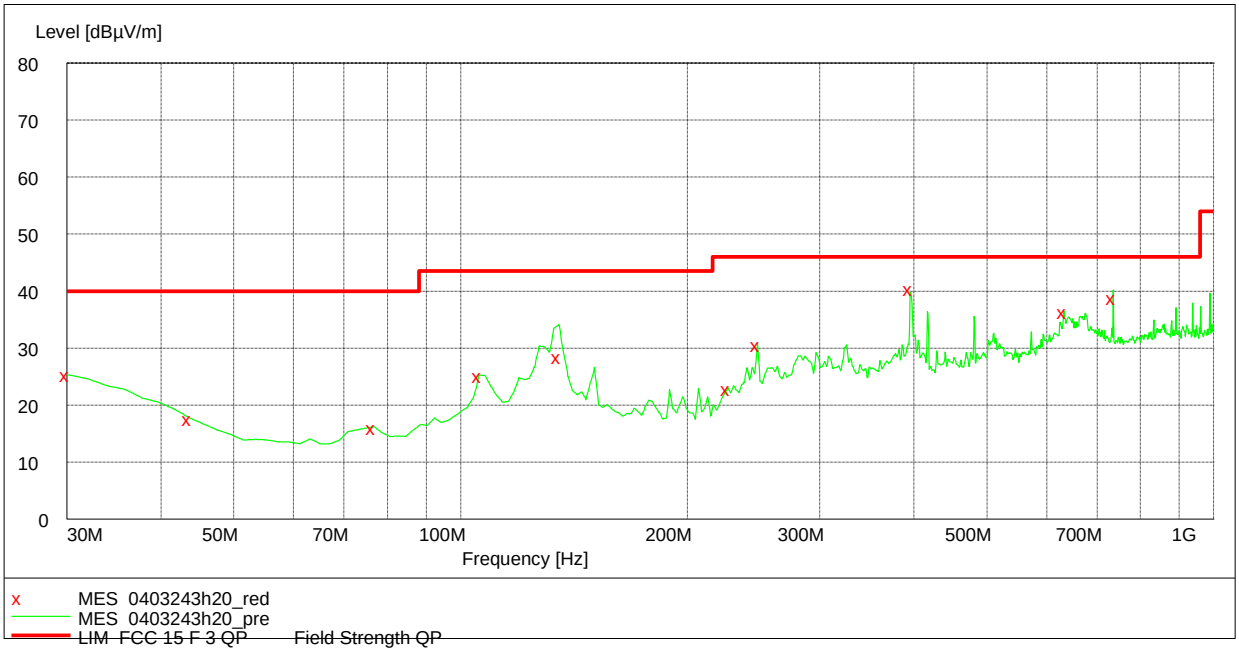


7.4 Test Results of Radiated Emissions

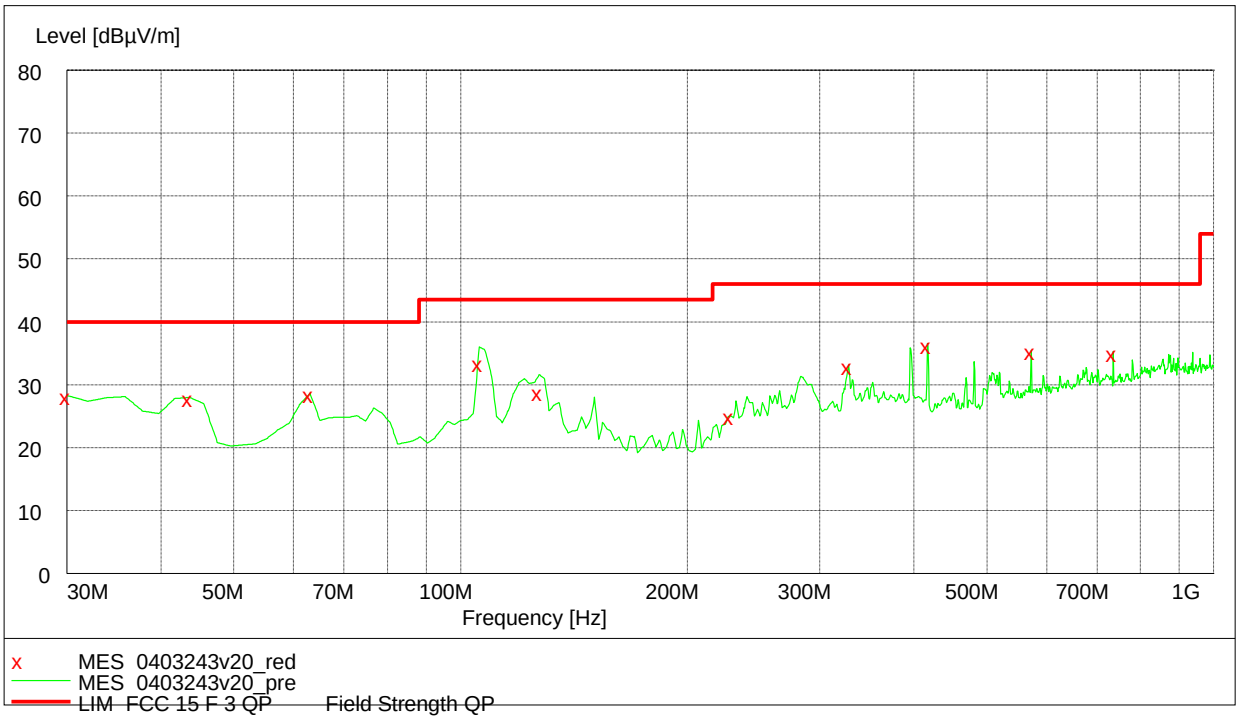
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	25.40	21.40	40.00	14.60	PK
H	105.81	25.30	13.00	43.50	18.20	QP
H	134.97	28.65	13.30	43.50	14.85	PK
H	247.72	30.80	14.40	46.00	15.20	PK
H	395.45	40.51	18.30	46.00	5.49	QP
H	735.63	38.89	23.00	46.00	7.11	QP
V	30.00	28.30	21.40	40.00	11.70	PK
V	63.05	28.60	8.10	40.00	11.40	PK
V	105.81	33.57	13.00	43.50	9.93	QP
V	127.19	28.96	13.70	43.50	14.54	QP
V	416.83	36.50	18.80	46.00	9.50	QP
V	572.34	35.50	21.50	46.00	10.50	PK

Note: The worst test result (30MHz to 1GHz) of 802.11b channel L (2412MHz) was chosen to list in the report as representative.

Test result above 1GHz:
The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	52.44	31.2	74	21.56	PK
	H/V	2390.00	43.61	31.2	54	10.39	AV
	H/V	4824.00	42.78	2.7	74	31.22	PK
	H/V	4824.00	36.49	2.7	54	17.51	AV
M	H/V	4874.00	43.81	2.67	74	30.19	PK
	H/V	4874.00	36.78	2.67	54	17.22	AV
H	H/V	2483.50	52.65	31.19	74	21.35	PK
	H/V	2483.50	43.83	31.19	54	10.17	AV
	H/V	4924.00	44.24	2.77	74	29.76	PK
	H/V	4924.00	38.37	2.77	54	15.63	AV

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	53.37	31.2	74	20.63	PK
	H/V	2390.00	45.63	31.2	54	8.37	AV
	H/V	4824.00	40.55	2.7	74	33.45	PK
	H/V	4824.00	33.72	2.7	54	20.28	AV
M	H/V	4874.00	41.86	2.67	74	32.14	PK
	H/V	4874.00	34.93	2.67	54	19.07	AV
H	H/V	2483.50	53.18	31.19	74	20.82	PK
	H/V	2483.50	44.39	31.19	54	9.61	AV
	H/V	4924.00	42.65	2.77	74	31.35	PK
	H/V	4924.00	36.07	2.77	54	17.93	AV

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	53.72	31.2	74	20.28	PK
	H/V	2390.00	45.81	31.2	54	8.19	AV
	H/V	4824.00	40.37	2.7	74	33.63	PK
	H/V	4824.00	33.25	2.7	54	20.75	AV
M	H/V	4874.00	41.43	2.67	74	32.57	PK
	H/V	4874.00	34.62	2.67	54	19.38	AV
H	H/V	2483.50	53.57	31.19	74	20.43	PK
	H/V	2483.50	44.61	31.19	54	9.39	AV
	H/V	4924.00	42.48	2.77	74	31.52	PK
	H/V	4924.00	36.56	2.77	54	17.44	AV

802.11n(HT40)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	61.51	31.2	74	12.49	PK
	H	2390.00	52.33	31.2	54	1.67	AV
	H	4844.00	41.77	2.9	74	32.23	PK
	H	4844.00	34.82	2.9	54	19.18	AV
M	H	4874.00	42.69	2.67	74	31.31	PK
	H	4874.00	35.25	2.67	54	18.75	AV
H	H	2483.50	60.58	31.19	74	13.42	PK
	H	2483.50	52.23	31.19	54	1.77	AV
	H	4904.00	42.74	2.73	74	31.26	PK
	H	4904.00	35.57	2.73	54	18.43	AV

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. 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.

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.

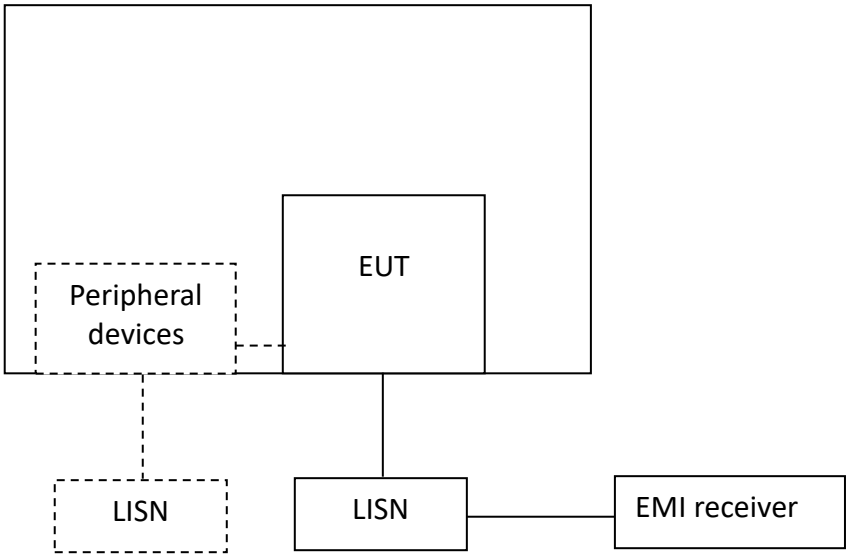
8 Power line conducted emission

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.

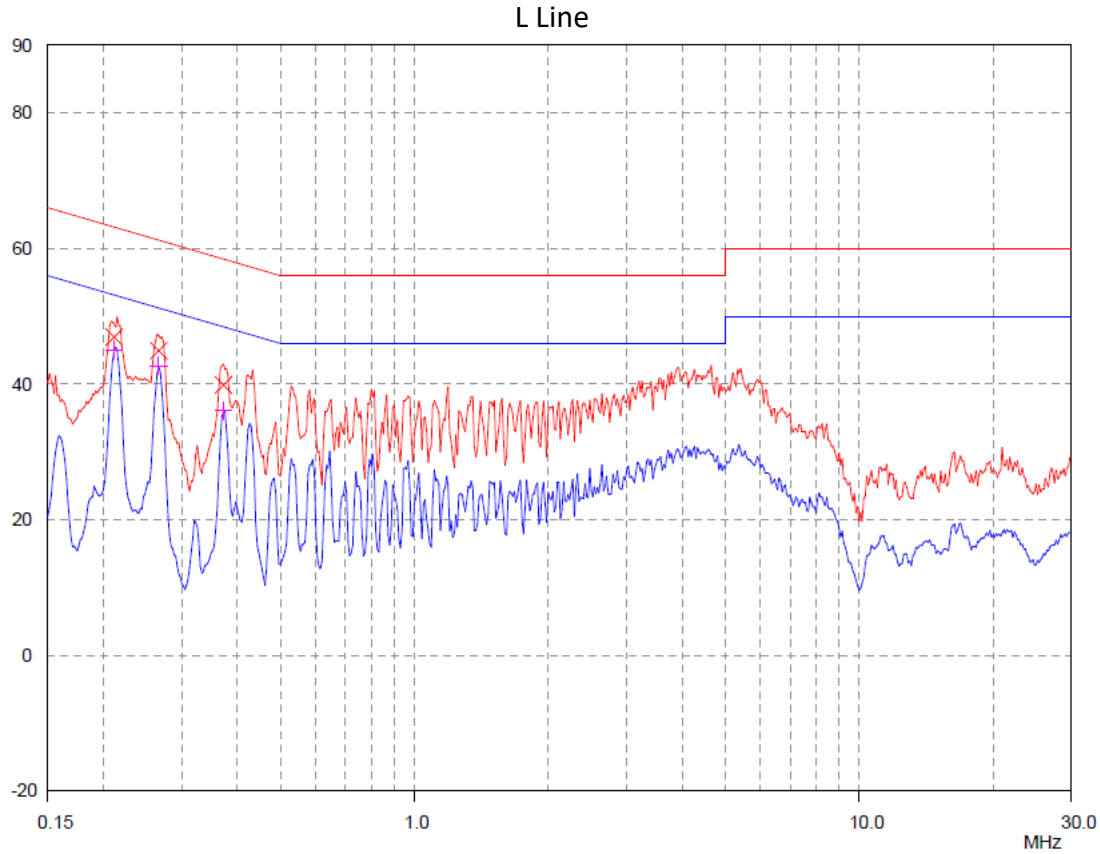
The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

Charging mode

Charger: C1

Test Curve:



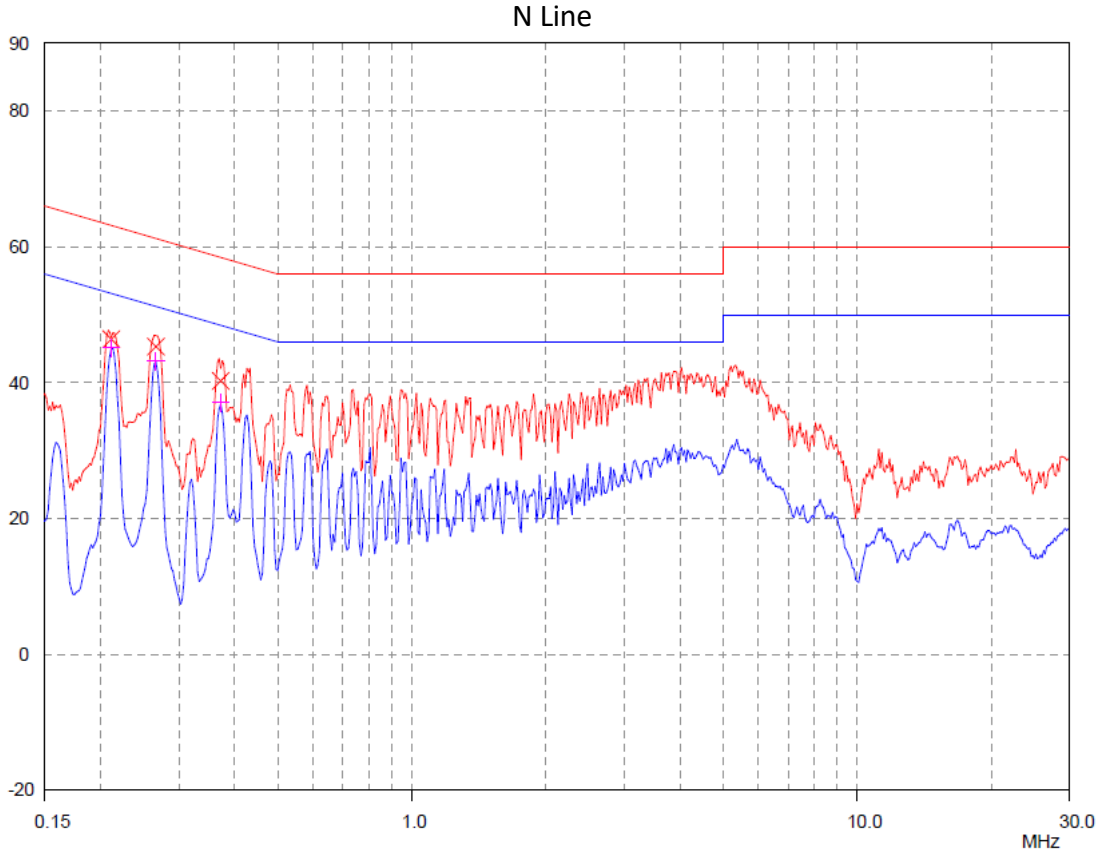
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.21	*	63.15	*	45.03	53.15	8.12
0.27	*	61.24	*	42.70	51.24	8.54
0.37	*	58.46	*	*	48.46	*
2.88	*	56.00	*	*	46.00	*
4.73	*	56.00	*	*	46.00	*
19.40	*	60.00	*	*	50.00	*

Note: *means margin is more than 10dB.

TEST REPORT

Test Curve:



Test Data:

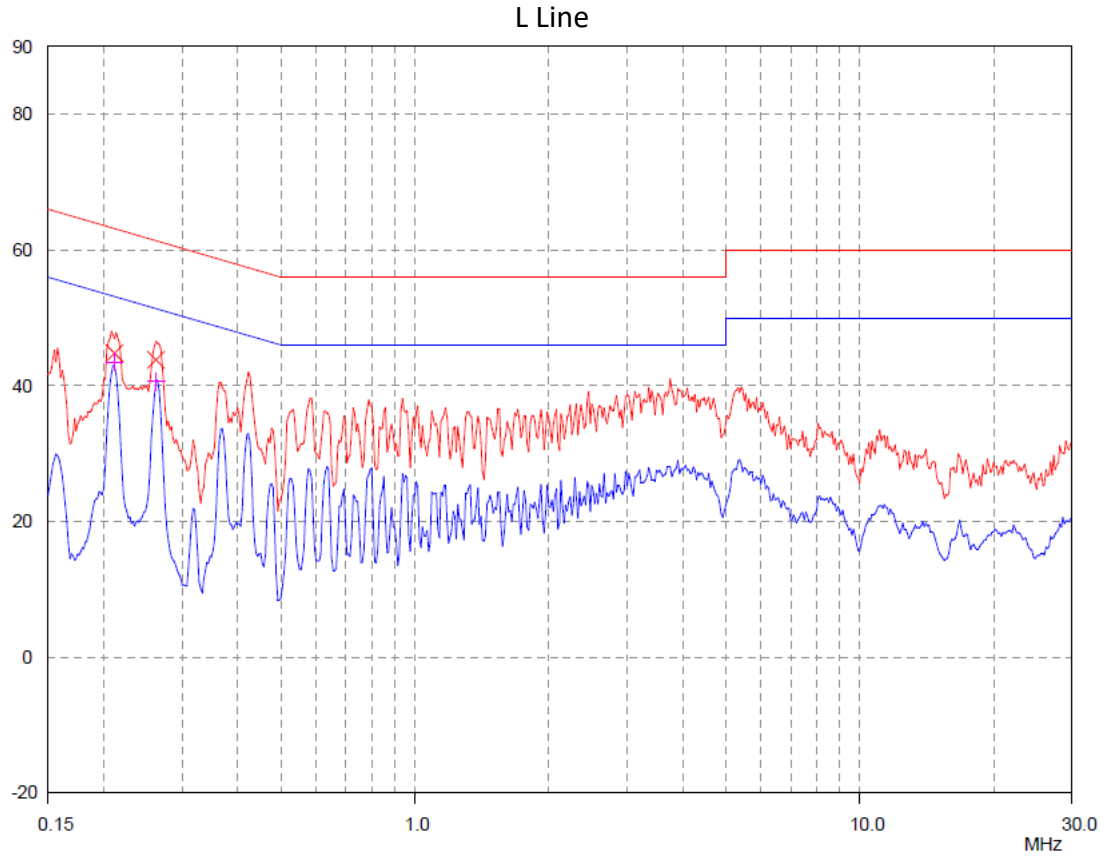
Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.21	*	63.15	*	45.14	53.15	8.01
0.27	*	61.24	*	43.16	51.24	8.08
0.37	*	58.46	*	*	48.46	*
2.88	*	56.00	*	*	46.00	*
4.73	*	56.00	*	*	46.00	*
19.40	*	60.00	*	*	50.00	*

Note: *means margin is more than 10dB.

TEST REPORT

Charger: BC254480030

Test Curve:



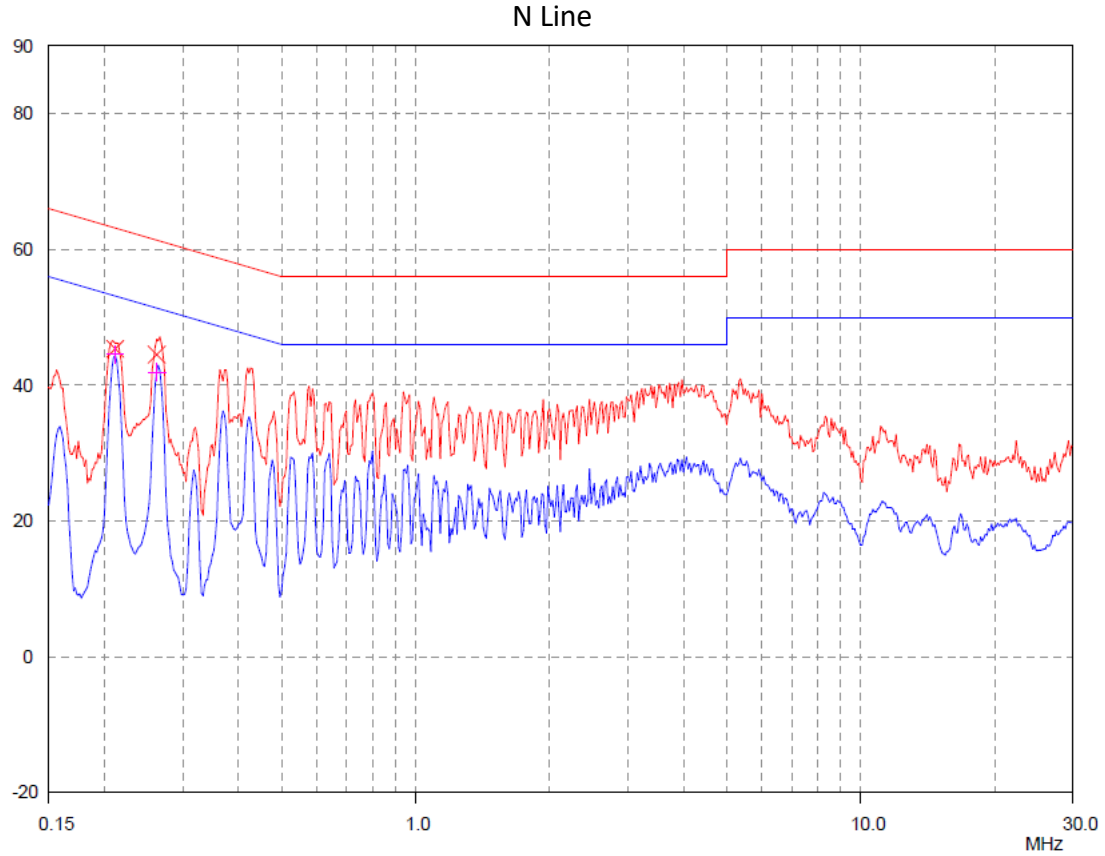
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.21	*	63.15	*	43.43	53.15	9.72
0.26	*	61.37	*	*	51.37	*
1.60	*	56.00	*	*	46.00	*
2.88	*	56.00	*	*	46.00	*
4.73	*	56.00	*	*	46.00	*
19.40	*	60.00	*	*	50.00	*

Note: *means margin is more than 10dB.

TEST REPORT

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.21	*	63.15	*	44.55	53.15	8.60
0.26	*	61.37	*	41.91	51.37	9.46
1.60	*	56.00	*	*	46.00	*
2.88	*	56.00	*	*	46.00	*
4.73	*	56.00	*	*	46.00	*
19.40	*	60.00	*	*	50.00	*

Note: *means margin is more than 10dB.

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: **Tested**

9.1 Limit

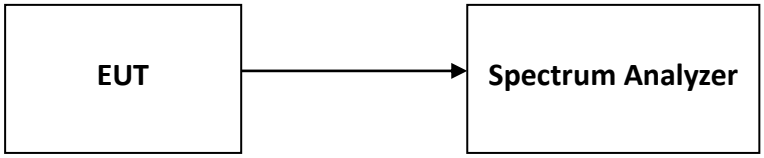
None

9.2 Measurement Procedure

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 a permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

Appendix A: Test results

1. RF Output Power

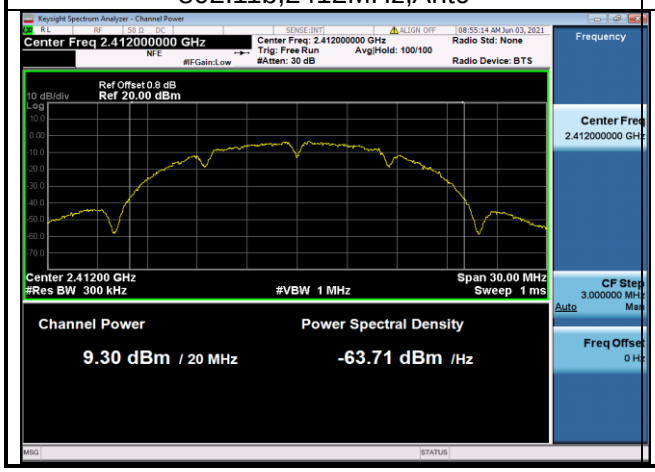
1.1 Test Result and Data

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	3.75	13.05	30	16.05	Pass
802.11b	2437	Ant0	3.76	15.05	30	18.05	Pass
802.11b	2462	Ant0	3.76	16.00	30	19.00	Pass
802.11g	2412	Ant0	11.54	9.35	30	12.35	Pass
802.11g	2437	Ant0	10.38	11.99	30	14.99	Pass
802.11g	2462	Ant0	11.57	13.64	30	16.64	Pass
802.11n (HT20)	2412	Ant0	11.82	6.67	30	9.67	Pass
802.11n (HT20)	2437	Ant0	11.87	9.50	30	12.50	Pass
802.11n (HT20)	2462	Ant0	11.86	11.53	30	14.53	Pass
802.11n (HT40)	2422	Ant0	14.88	8.07	30	11.07	Pass
802.11n (HT40)	2437	Ant0	14.99	14.25	30	17.25	Pass
802.11n (HT40)	2452	Ant0	15.50	12.53	30	15.53	Pass

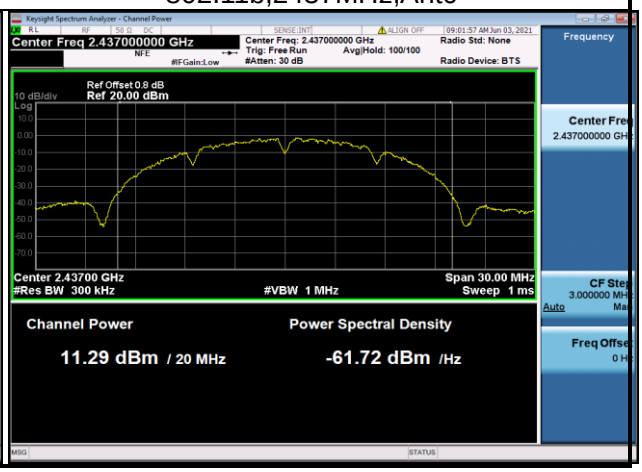
Conclusion: The maximum EIRP = 16.00dBm+3dBi = 19.00dBm = 0.079W which is lower than the limit of 4W listed in RSS-247.

1.2 Test Plots

802.11b,2412MHz,Ant0

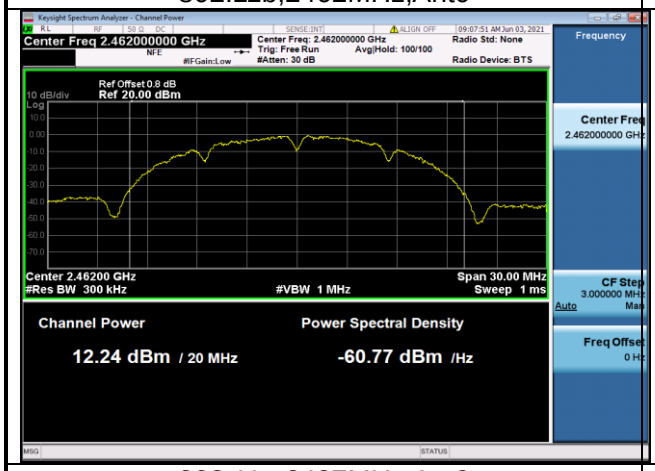


802.11b,2437MHz,Ant0

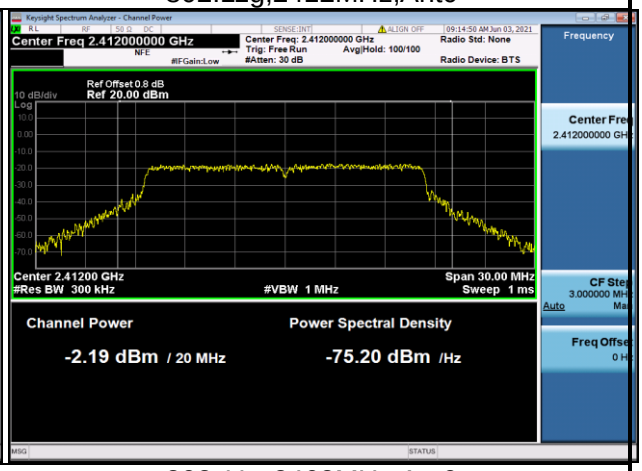


TEST REPORT

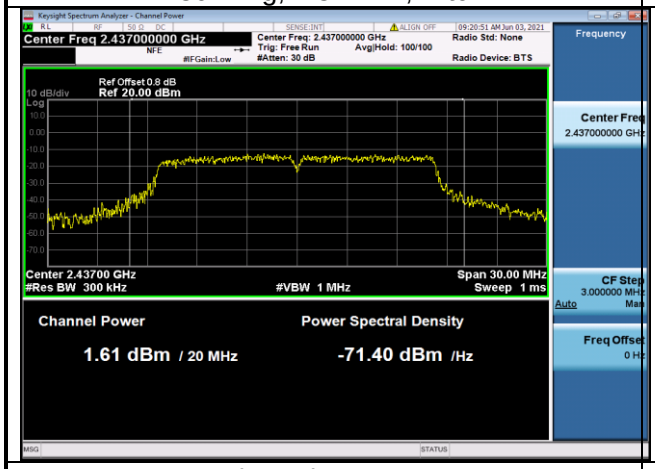
802.11b,2462MHz,Ant0



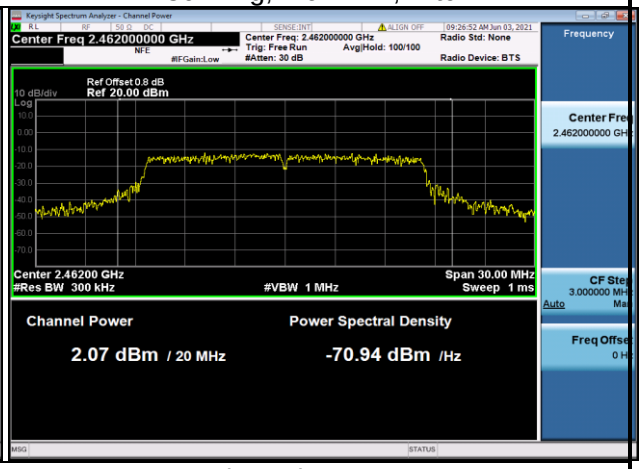
802.11g,2412MHz,Ant0



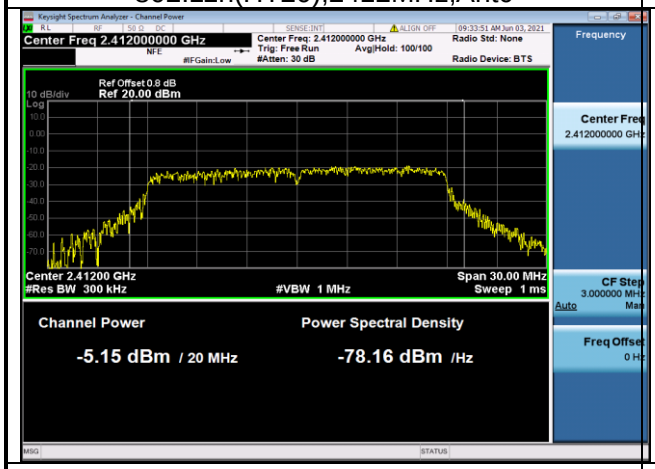
802.11g,2437MHz,Ant0



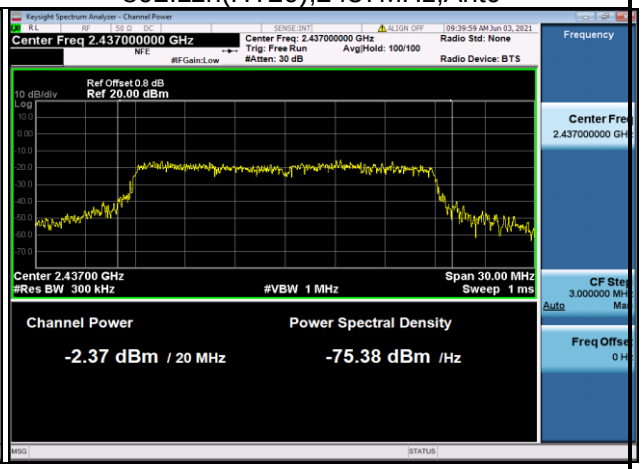
802.11g,2462MHz,Ant0



802.11n(HT20),2412MHz,Ant0

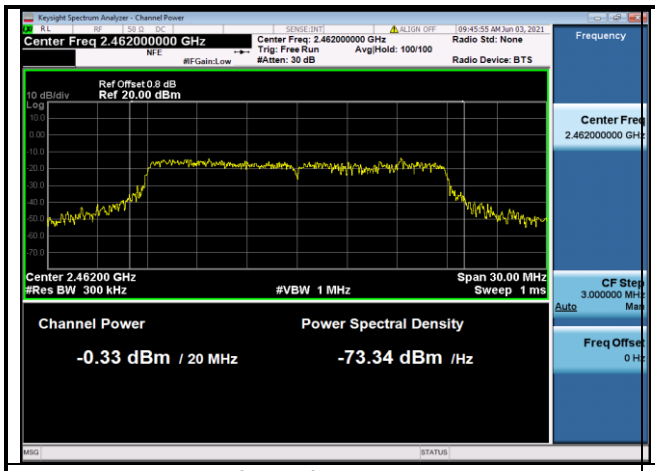


802.11n(HT20),2437MHz,Ant0

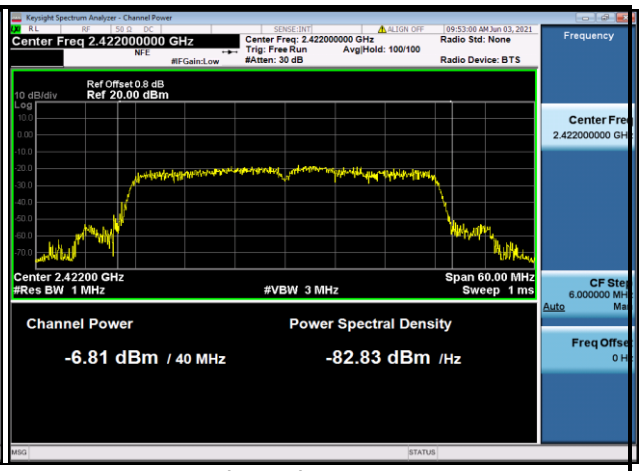


802.11n(HT20),2462MHz,Ant0

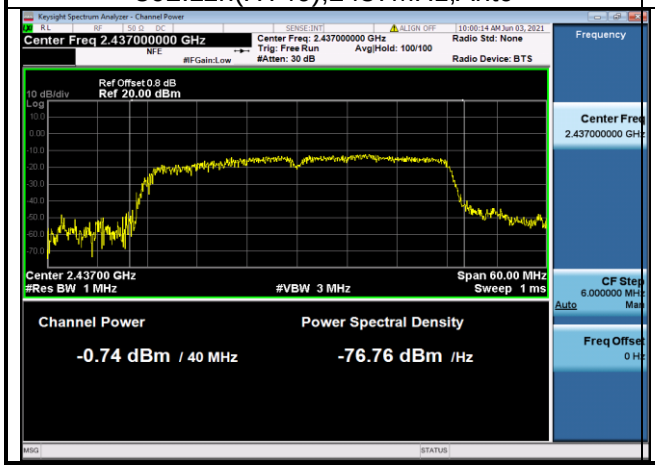
802.11n(HT40),2422MHz,Ant0

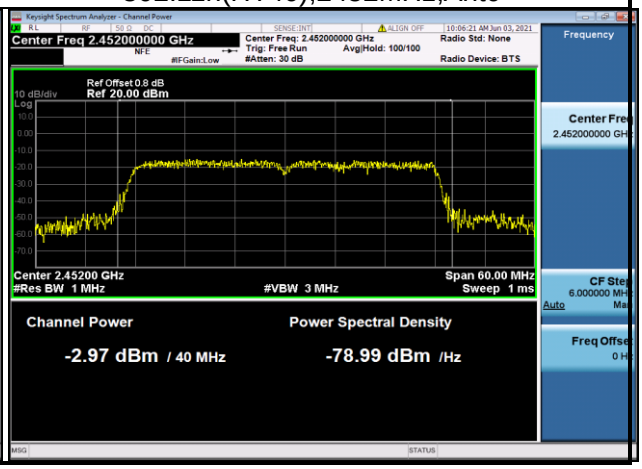


802.11n(HT40),2437MHz,Ant0



802.11n(HT40),2452MHz,Ant0





2. Minimum 6dB bandwidth

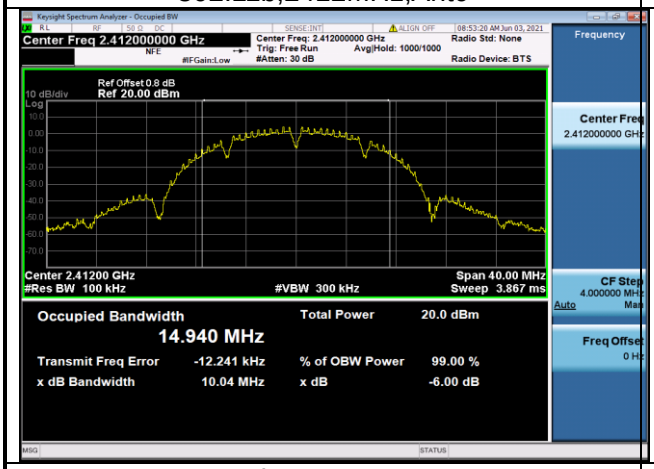
2.1 Test Result and Data

WLAN Occupied 6dB Bandwidth				
Mode	Test Frequency (MHz)	Ant	Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	10.04	Pass
802.11b	2437	Ant0	9.59	Pass
802.11b	2462	Ant0	9.60	Pass
802.11g	2412	Ant0	16.39	Pass
802.11g	2437	Ant0	16.36	Pass
802.11g	2462	Ant0	16.33	Pass
802.11n (HT20)	2412	Ant0	17.59	Pass
802.11n (HT20)	2437	Ant0	17.58	Pass
802.11n (HT20)	2462	Ant0	17.58	Pass
802.11n (HT40)	2422	Ant0	33.88	Pass

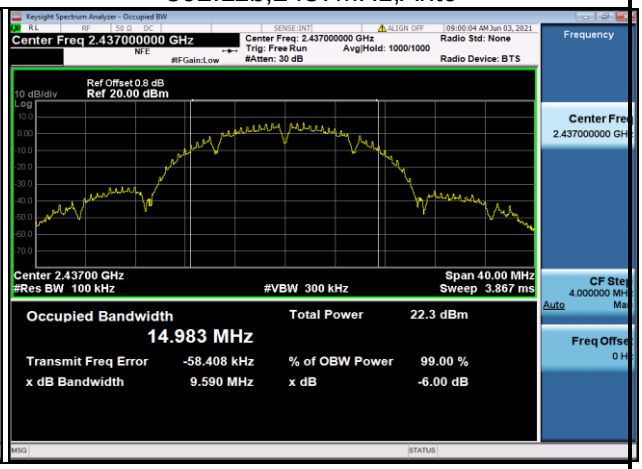
802.11n (HT40)	2437	Ant0	35.17	Pass
802.11n (HT40)	2452	Ant0	35.20	Pass

2.2 Test Plots

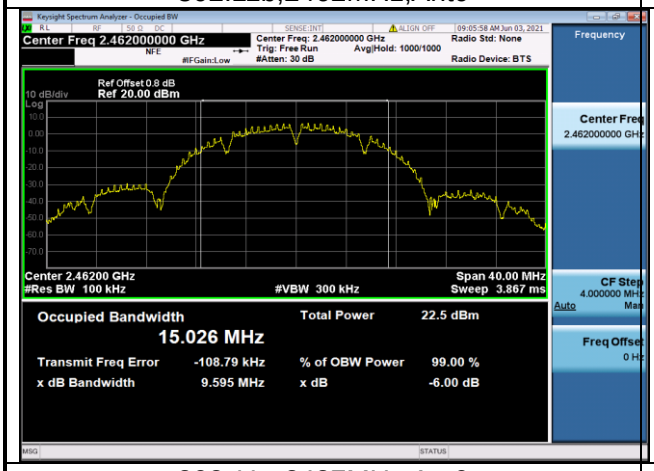
802.11b,2412MHz,Ant0



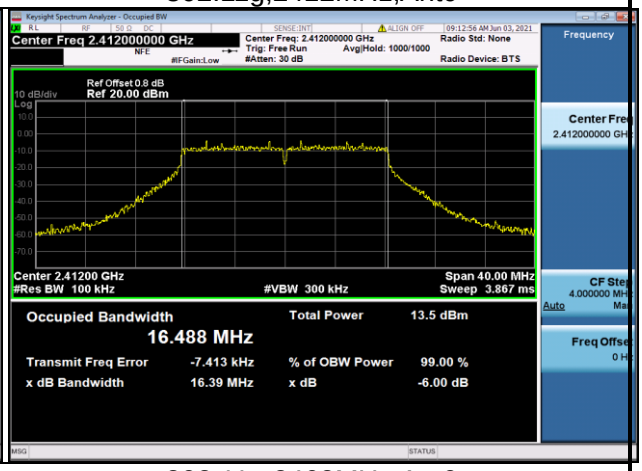
802.11b,2437MHz,Ant0



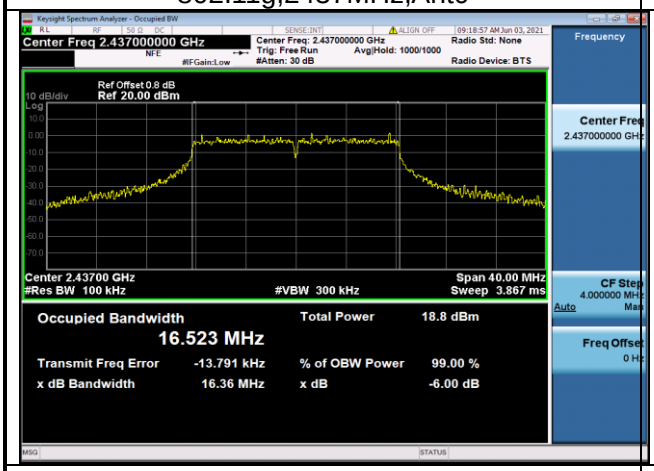
802.11b,2462MHz,Ant0



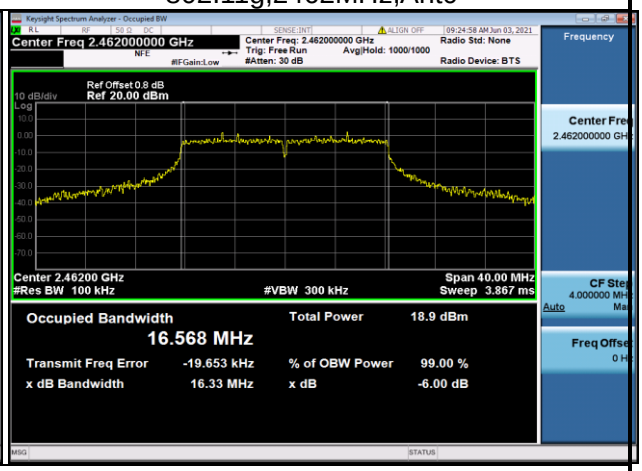
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

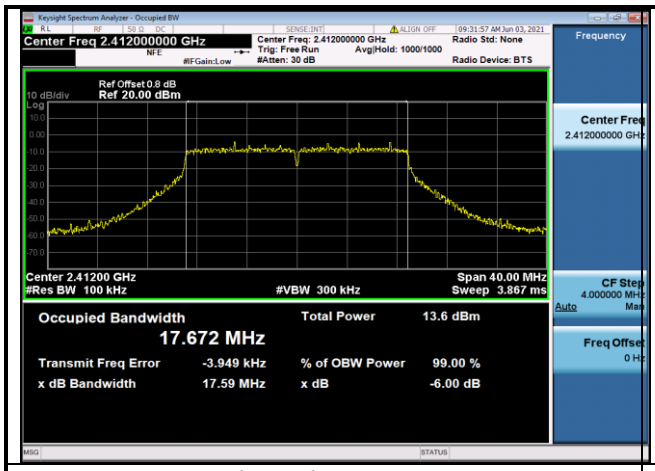


802.11g,2462MHz,Ant0

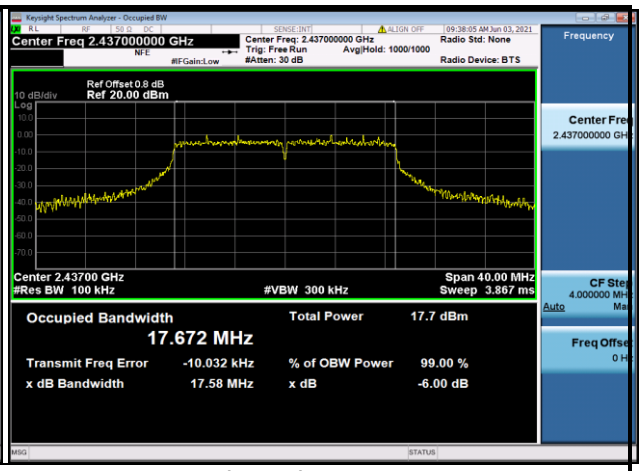


802.11n(HT20),2412MHz,Ant0

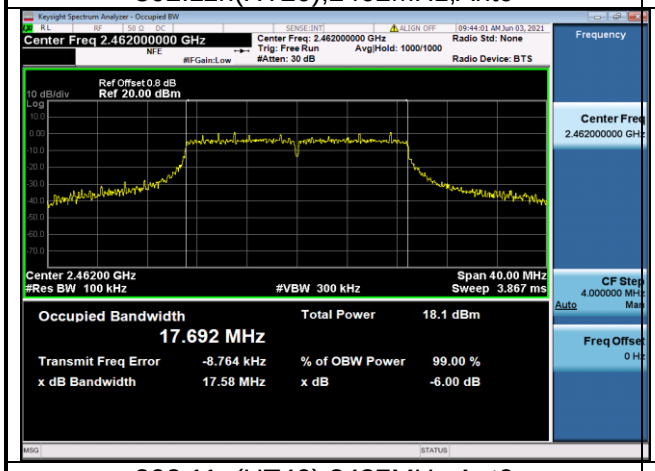
802.11n(HT20),2437MHz,Ant0



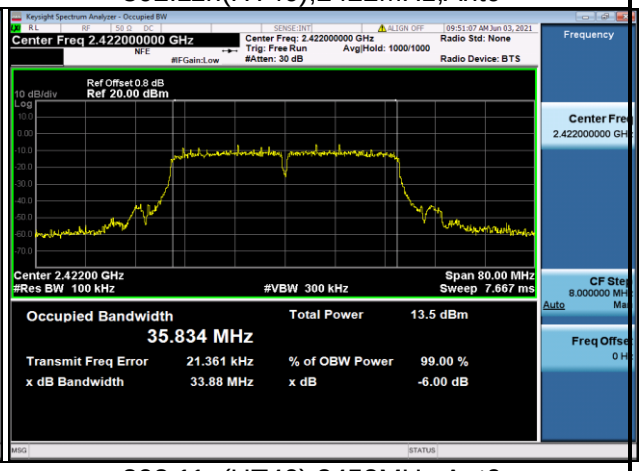
802.11n(HT20),2462MHz,Ant0



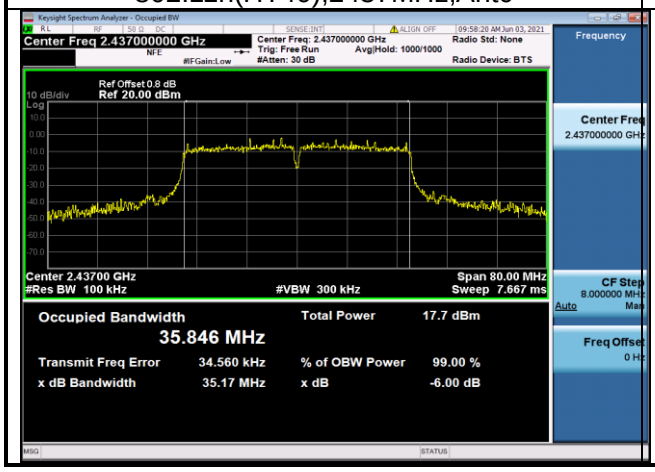
802.11n(HT40),2422MHz,Ant0

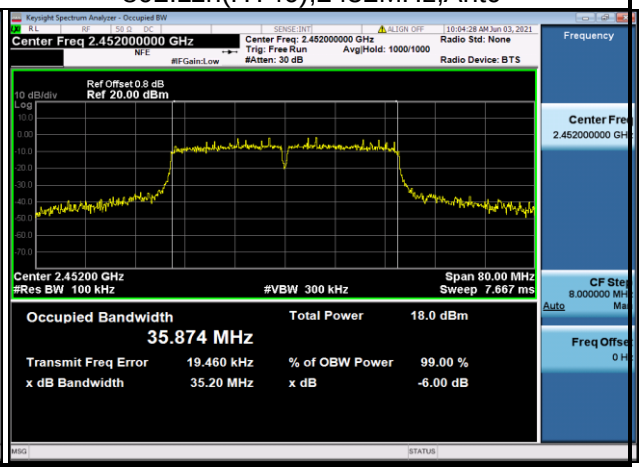


802.11n(HT40),2437MHz,Ant0



802.11n(HT40),2452MHz,Ant0





3. Occupied Bandwidth

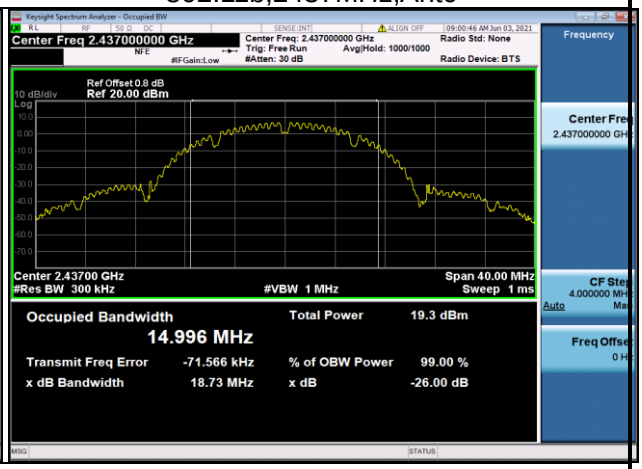
3.1 Test Result and Data

WLAN 99% Occupied Bandwidth				
Mode	Test Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	14.966	Pass
802.11b	2437	Ant0	14.996	Pass
802.11b	2462	Ant0	15.066	Pass
802.11g	2412	Ant0	16.905	Pass
802.11g	2437	Ant0	16.955	Pass
802.11g	2462	Ant0	17.049	Pass
802.11n (HT20)	2412	Ant0	17.931	Pass
802.11n (HT20)	2437	Ant0	17.893	Pass
802.11n (HT20)	2462	Ant0	17.964	Pass
802.11n (HT40)	2422	Ant0	36.113	Pass
802.11n (HT40)	2437	Ant0	36.078	Pass
802.11n (HT40)	2452	Ant0	36.159	Pass

3.2 Test Plots

802.11b,2412MHz,Ant0

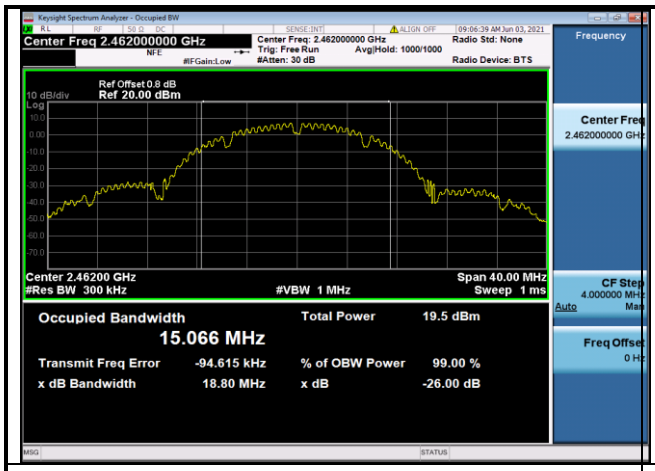
802.11b,2437MHz,Ant0



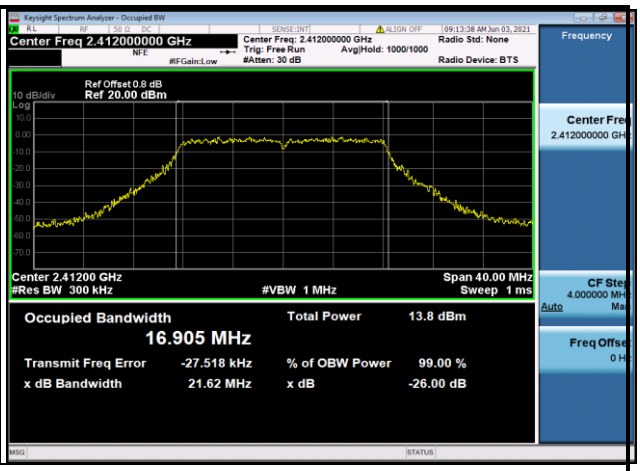
802.11b,2462MHz,Ant0

802.11g,2412MHz,Ant0

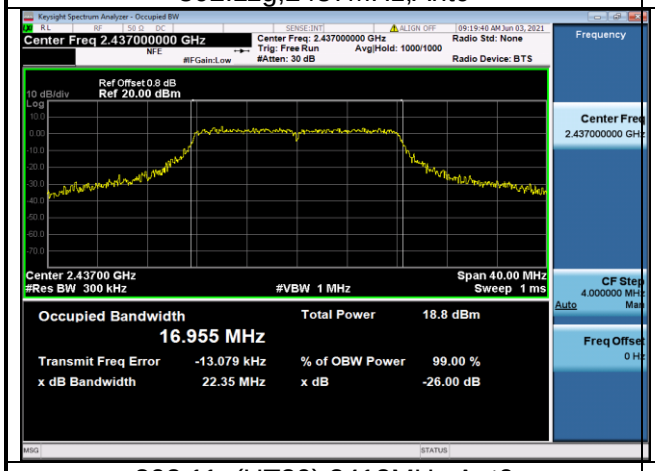
TEST REPORT



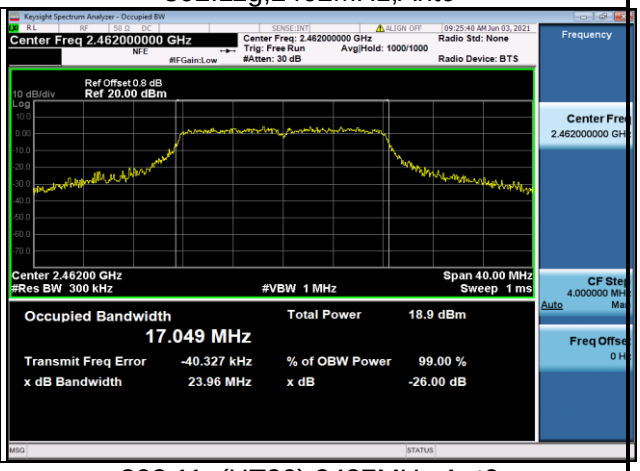
802.11g,2437MHz,Ant0



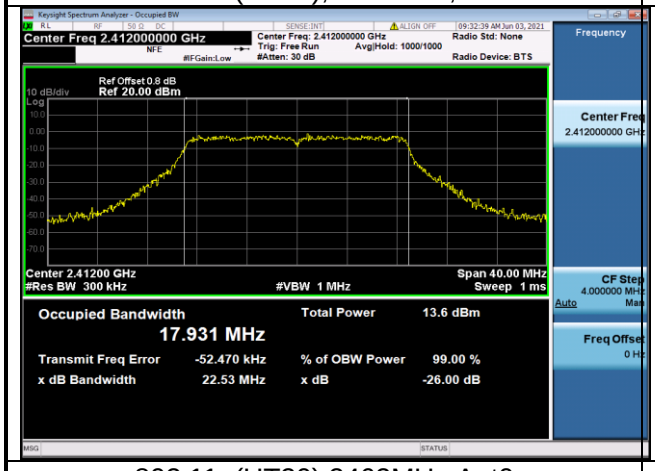
802.11g,2462MHz,Ant0



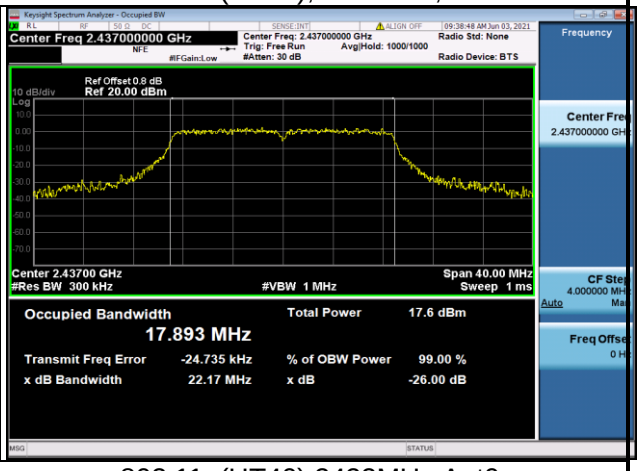
802.11n(HT20),2412MHz,Ant0



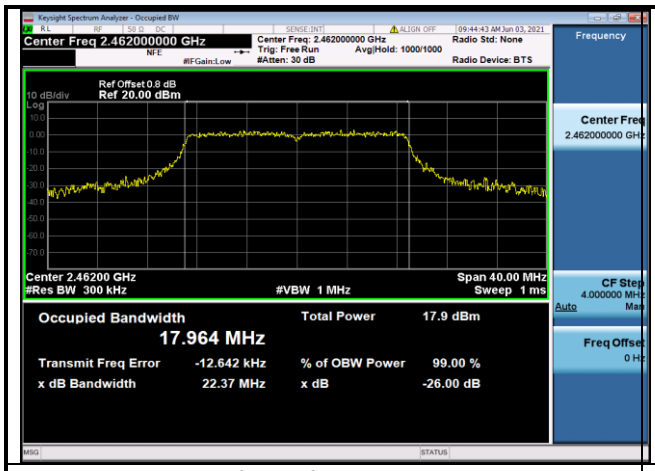
802.11n(HT20),2437MHz,Ant0

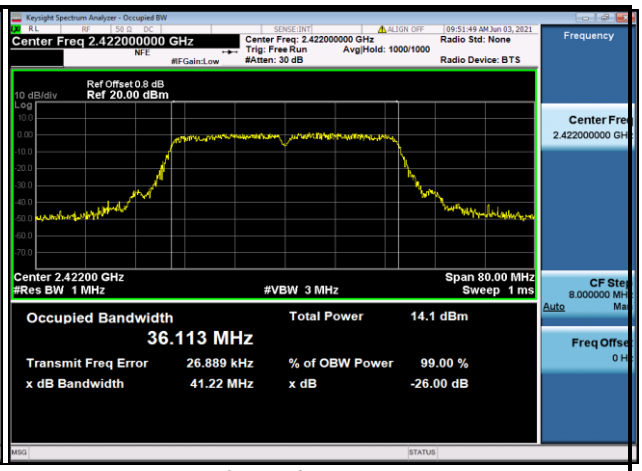


802.11n(HT20),2462MHz,Ant0



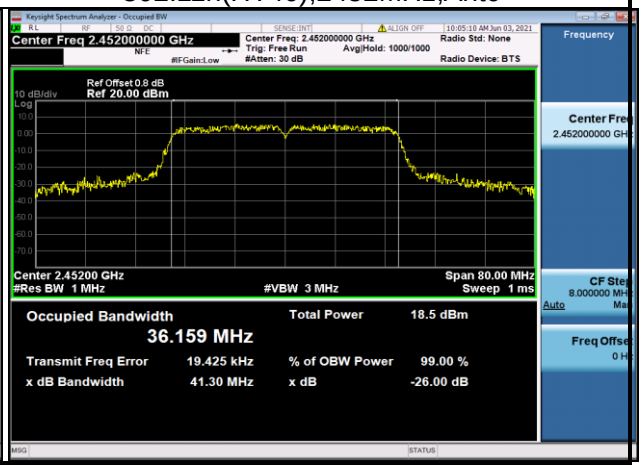
802.11n(HT40),2422MHz,Ant0





802.11n(HT40),2437MHz,Ant0

802.11n(HT40),2452MHz,Ant0



4. Power Spectral Density

4.1 Test Result and 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	3.75	-17.904	3	8	Pass
802.11b	2437	Ant0	3.76	-15.660	3	8	Pass
802.11b	2462	Ant0	3.76	-15.742	3	8	Pass
802.11g	2412	Ant0	11.54	-20.907	3	8	Pass
802.11g	2437	Ant0	10.38	-18.076	3	8	Pass
802.11g	2462	Ant0	11.57	-17.043	3	8	Pass
802.11n (HT20)	2412	Ant0	11.82	-22.940	3	8	Pass
802.11n (HT20)	2437	Ant0	11.87	-17.715	3	8	Pass
802.11n	2462	Ant0	11.86	-20.243	3	8	Pass

(HT20)							
802.11n (HT40)	2422	Ant0	14.88	-25.938	3	8	Pass
802.11n (HT40)	2437	Ant0	14.99	-18.833	3	8	Pass
802.11n (HT40)	2452	Ant0	15.50	-19.492	3	8	Pass

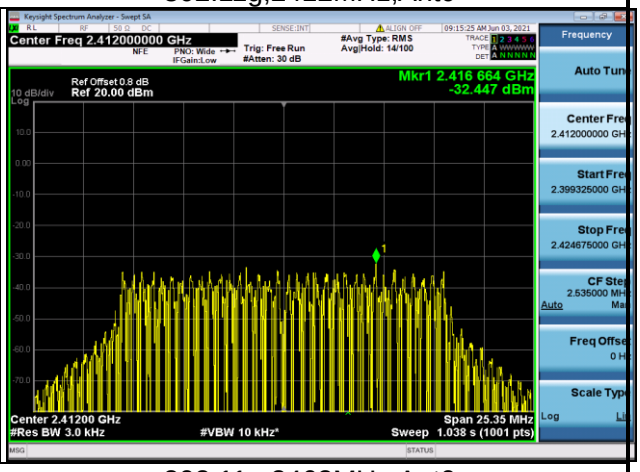
4.2 Test Plots

802.11b,2412MHz,Ant0

802.11b,2437MHz,Ant0

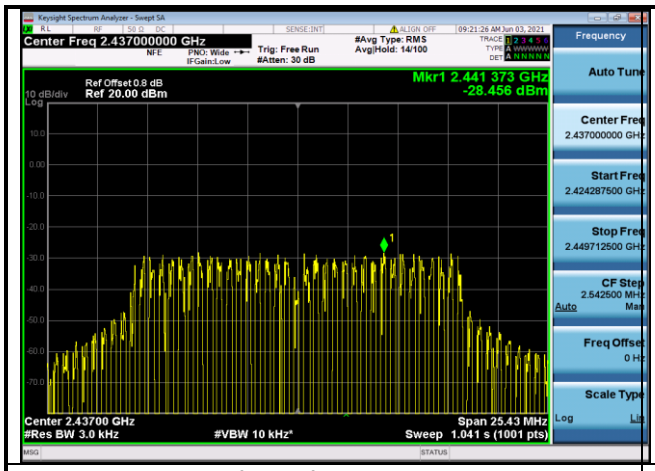
802.11b,2462MHz,Ant0

802.11g,2412MHz,Ant0

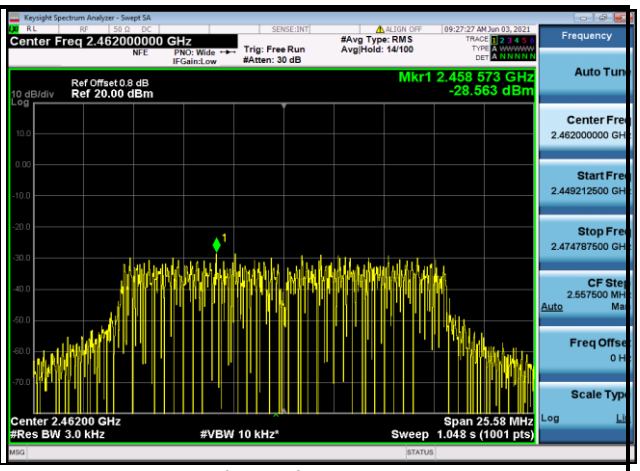


802.11g,2437MHz,Ant0

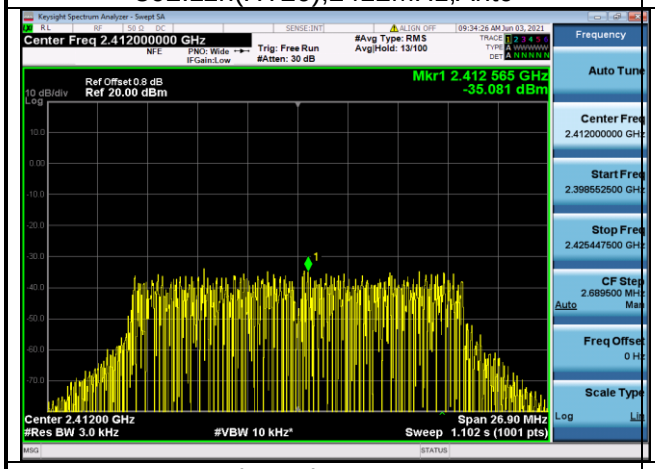
802.11g,2462MHz,Ant0



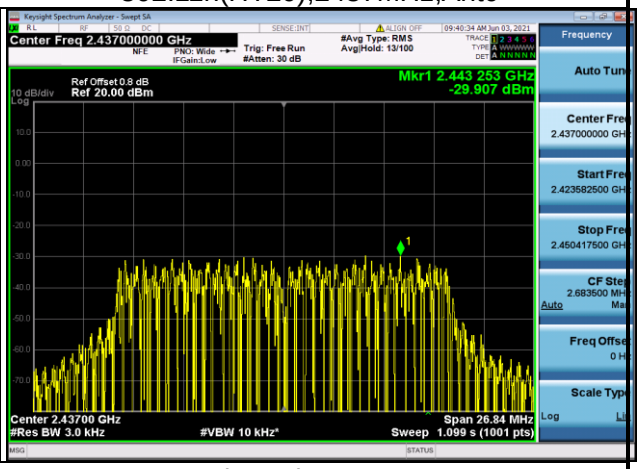
802.11n(HT20),2412MHz,Ant0



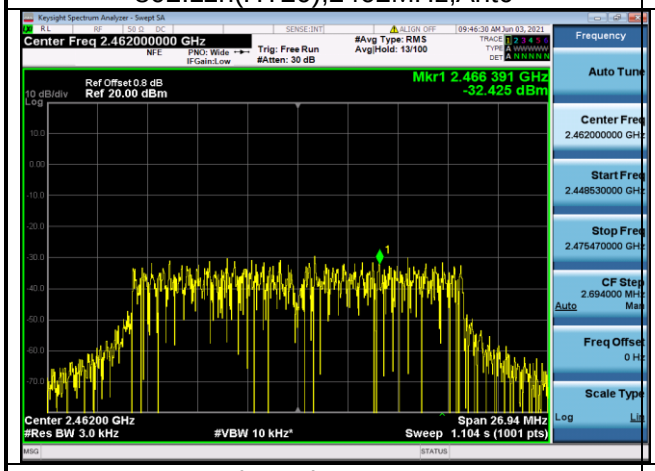
802.11n(HT20),2437MHz,Ant0



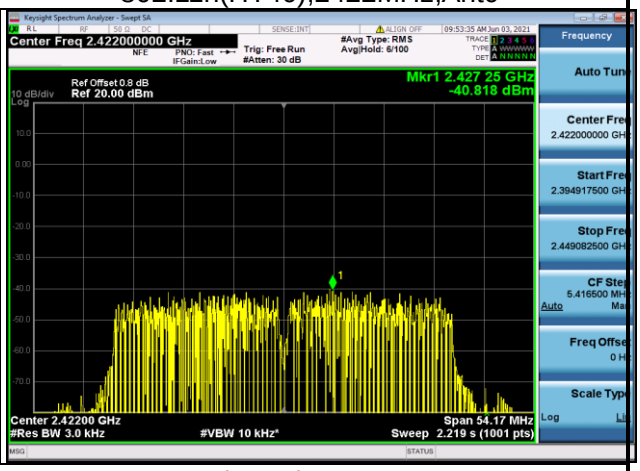
802.11n(HT20),2462MHz,Ant0



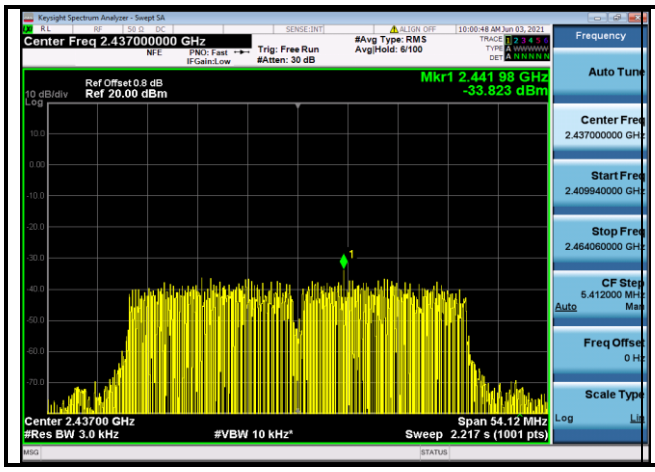
802.11n(HT40),2422MHz,Ant0

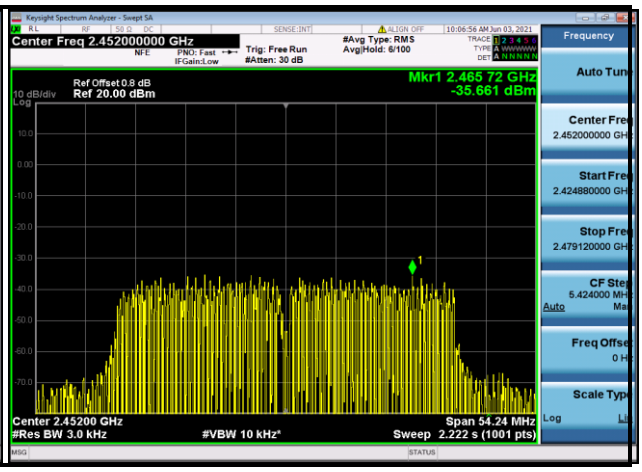


802.11n(HT40),2437MHz,Ant0



802.11n(HT40),2452MHz,Ant0


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.437000000 GHz
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 6/100
Ref Offset 0.8 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.441 98 GHz
-33.823 dBm
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz*
Span 54.12 MHz
Sweep 2.217 s (1001 pts)
Frequency
Auto Tune
Center Freq
2.437000000 GHz
Start Freq
2.409940000 GHz
Stop Freq
2.464060000 GHz
CF Step
5.412000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.452000000 GHz
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 6/100
Ref Offset 0.8 dB
10 dB/div Ref 20.00 dBm
Mkr1 2.465 72 GHz
-35.661 dBm
Center 2.45200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz*
Span 54.24 MHz
Sweep 2.222 s (1001 pts)
Frequency
Auto Tune
Center Freq
2.452000000 GHz
Start Freq
2.424880000 GHz
Stop Freq
2.479120000 GHz
CF Step
5.424000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

5. Emission outside the frequency band
5.1 Test Result and Data

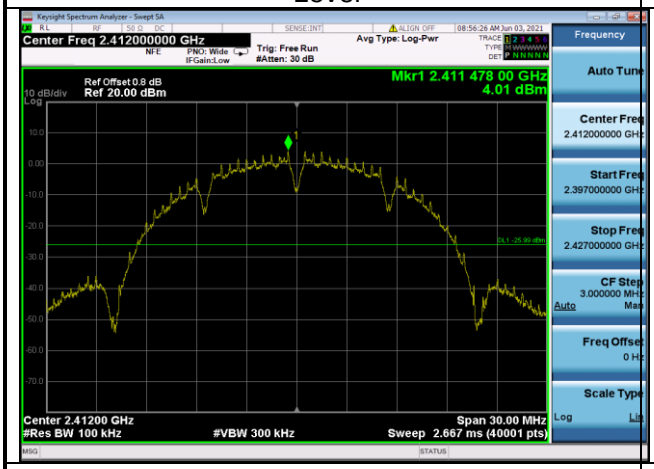
WLAN Transmitter Spurious Emission						
Mode	Test Frequency (MHz)	Ant	Plot No.	Frequency Range	Emission (dBm)	Result
802.11b	2412	Ant0	1	Reference Level	4.01	Pass
802.11b	2412	Ant0	2	Band Edge	-36.79	Pass
802.11b	2412	Ant0	3	30MHz~2310MHz	-56.94	Pass
802.11b	2412	Ant0	4	2500MHz~5000MHz	-49.93	Pass
802.11b	2412	Ant0	5	5000MHz~15000MHz	-55.08	Pass
802.11b	2412	Ant0	6	15000MHz~25000MHz	-53.02	Pass
802.11b	2437	Ant0	1	Reference Level	6.01	Pass
802.11b	2437	Ant0	2	Band Edge	-53.97	Pass
802.11b	2437	Ant0	3	30MHz~2310MHz	-56.40	Pass
802.11b	2437	Ant0	4	2500MHz~5000MHz	-45.98	Pass
802.11b	2437	Ant0	5	5000MHz~15000MHz	-54.27	Pass
802.11b	2437	Ant0	6	15000MHz~25000MHz	-52.30	Pass
802.11b	2462	Ant0	1	Reference Level	6.31	Pass
802.11b	2462	Ant0	2	Band Edge	-52.20	Pass
802.11b	2462	Ant0	3	30MHz~2310MHz	-56.71	Pass
802.11b	2462	Ant0	4	2500MHz~5000MHz	-42.90	Pass
802.11b	2462	Ant0	5	5000MHz~15000MHz	-55.20	Pass
802.11b	2462	Ant0	6	15000MHz~25000MHz	-52.65	Pass
802.11g	2412	Ant0	1	Reference Level	-3.85	Pass
802.11g	2412	Ant0	2	Band Edge	-42.70	Pass
802.11g	2412	Ant0	3	30MHz~2310MHz	-56.73	Pass
802.11g	2412	Ant0	4	2500MHz~5000MHz	-53.19	Pass
802.11g	2412	Ant0	5	5000MHz~15000MHz	-54.90	Pass
802.11g	2412	Ant0	6	15000MHz~25000MHz	-53.14	Pass
802.11g	2437	Ant0	1	Reference Level	1.64	Pass
802.11g	2437	Ant0	2	Band Edge	-50.31	Pass
802.11g	2437	Ant0	3	30MHz~2310MHz	-56.74	Pass

802.11g	2437	Ant0	4	2500MHz~5000MHz	-52.35	Pass
802.11g	2437	Ant0	5	5000MHz~15000MHz	-55.28	Pass
802.11g	2437	Ant0	6	15000MHz~25000MHz	-52.80	Pass
802.11g	2462	Ant0	1	Reference Level	1.24	Pass
802.11g	2462	Ant0	2	Band Edge	-44.22	Pass
802.11g	2462	Ant0	3	30MHz~2310MHz	-57.43	Pass
802.11g	2462	Ant0	4	2500MHz~5000MHz	-53.55	Pass
802.11g	2462	Ant0	5	5000MHz~15000MHz	-54.94	Pass
802.11g	2462	Ant0	6	15000MHz~25000MHz	-53.23	Pass
802.11n (HT20)	2412	Ant0	1	Reference Level	-3.80	Pass
802.11n (HT20)	2412	Ant0	2	Band Edge	-40.64	Pass
802.11n (HT20)	2412	Ant0	3	30MHz~2310MHz	-57.47	Pass
802.11n (HT20)	2412	Ant0	4	2500MHz~5000MHz	-53.22	Pass
802.11n (HT20)	2412	Ant0	5	5000MHz~15000MHz	-55.23	Pass
802.11n (HT20)	2412	Ant0	6	15000MHz~25000MHz	-51.51	Pass
802.11n (HT20)	2437	Ant0	1	Reference Level	0.85	Pass
802.11n (HT20)	2437	Ant0	2	Band Edge	-49.96	Pass
802.11n (HT20)	2437	Ant0	3	30MHz~2310MHz	-57.19	Pass
802.11n (HT20)	2437	Ant0	4	2500MHz~5000MHz	-53.58	Pass
802.11n (HT20)	2437	Ant0	5	5000MHz~15000MHz	-55.40	Pass
802.11n (HT20)	2437	Ant0	6	15000MHz~25000MHz	-52.36	Pass
802.11n (HT20)	2462	Ant0	1	Reference Level	0.06	Pass
802.11n (HT20)	2462	Ant0	2	Band Edge	-40.83	Pass
802.11n (HT20)	2462	Ant0	3	30MHz~2310MHz	-57.28	Pass
802.11n (HT20)	2462	Ant0	4	2500MHz~5000MHz	-53.45	Pass
802.11n (HT20)	2462	Ant0	5	5000MHz~15000MHz	-55.37	Pass
802.11n (HT20)	2462	Ant0	6	15000MHz~25000MHz	-52.34	Pass
802.11n (HT40)	2422	Ant0	1	Reference Level	-7.07	Pass

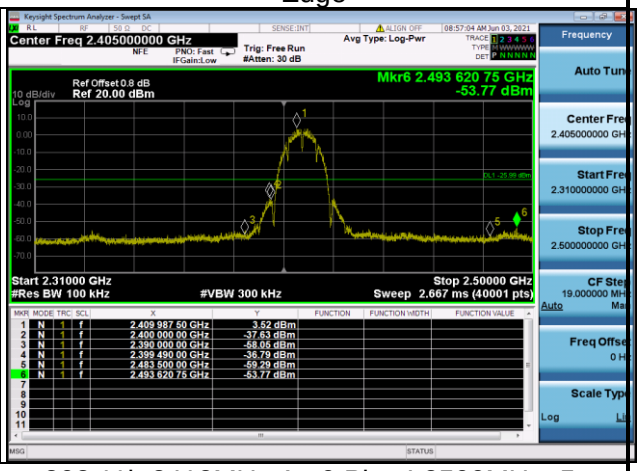
802.11n (HT40)	2422	Ant0	2	Band Edge	-41.69	Pass
802.11n (HT40)	2422	Ant0	3	30MHz~2310MHz	-57.25	Pass
802.11n (HT40)	2422	Ant0	4	2500MHz~5000MHz	-52.83	Pass
802.11n (HT40)	2422	Ant0	5	5000MHz~15000MHz	-54.89	Pass
802.11n (HT40)	2422	Ant0	6	15000MHz~25000MHz	-52.73	Pass
802.11n (HT40)	2437	Ant0	1	Reference Level	-1.76	Pass
802.11n (HT40)	2437	Ant0	2	Band Edge	-45.31	Pass
802.11n (HT40)	2437	Ant0	3	30MHz~2310MHz	-56.55	Pass
802.11n (HT40)	2437	Ant0	4	2500MHz~5000MHz	-53.94	Pass
802.11n (HT40)	2437	Ant0	5	5000MHz~15000MHz	-54.50	Pass
802.11n (HT40)	2437	Ant0	6	15000MHz~25000MHz	-52.68	Pass
802.11n (HT40)	2452	Ant0	1	Reference Level	-2.56	Pass
802.11n (HT40)	2452	Ant0	2	Band Edge	-39.68	Pass
802.11n (HT40)	2452	Ant0	3	30MHz~2310MHz	-57.39	Pass
802.11n (HT40)	2452	Ant0	4	2500MHz~5000MHz	-52.52	Pass
802.11n (HT40)	2452	Ant0	5	5000MHz~15000MHz	-55.45	Pass
802.11n (HT40)	2452	Ant0	6	15000MHz~25000MHz	-52.47	Pass

5.2 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~231

802.11b,2412MHz,Ant0,Plot 4,2500MHz~5