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Puppy Electronic Appliances Internet Technology Beijing Co.,Ltd

RF TEST REPORT

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

Model:
R30, R35

REPORT NUMBER:
190702274SHA-005

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TEST REPORT

Report no.: 190702274SHA-005

Applicant:	Puppy Electronic Appliances Internet Technology Beijing Co.,Ltd 7-605, 6th floor, No. 1 Building, No. 8 Courtyard, Guanghua Road, Chaoyang District, Beijing,China
Manufacturer:	Shenzhen Silver Star Intelligent Technology Co., Ltd. Building A1, Silver Star Hi-Tech Industrial Park, Guanguang Road, Guanlan Street, Longhua District, Shenzhen, Guangdong, China

FCC ID:	2AUJOR-3035
IC:	25444-R3035

SUMMARY:

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

47CFR Part 15 (2018): 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): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
Stephanie	Wade zhang
Project Engineer Stephanie Zhang	Reviewer Wade Zhang

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Revision History

Report No.	Version	Description	Issued Date
190702274SHA-005	Rev. 01	Initial issue of report	Aug 29, 2019

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

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Robot Vacuum Cleaner
Type/Model:	R30 , R35
Description of EUT:	The EUT is a vacuum cleaner which contains a WIFI 2.4GHz module. R30 & R35 share the same WIFI module. Since R35 has worse output power and radiated emission, therefore we tested R35 as representative after evaluation.
Rating:	R30 14,4V DC 25W; Docking station: Class II, Input:100-240VAC,50-60Hz Output: DC19V, 0.6A R35 14,4V DC 25W; Docking station: Class II, Input:100-240VAC,50-60Hz Output: DC24V, 1A
EUT type:	☐ Table top ☒ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	7/22/2019
Date of test:	7/22/2019 ~ 8/29/2019

1.2 Technical Specification

Frequency Range:	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 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7
Channel Separation:	5 MHz

1.3 Antenna information

Antenna No.	Model	Antenna type	Antenna Gain	Note
1	R30/R35	PCB	2dBi	-

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

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 Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2018)
ANSI C63.10 (2013)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (April 2018)
KDB 558074 (v05r01)

2.2 Mode of operation during the test

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

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

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

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
-	-	-	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	28°C	52% 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	28°C	55% RH
Power line conducted emission	27°C	52% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2020-07-14
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2019-11-29
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-11
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-12-10
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
☒	Horn antenna	R&S	HF 906	EC 3049	2019-11-16
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2020-03-04
☒	Power sensor	Agilent	U2021XA	EC 5338-1	2020-03-04
☒	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2020-03-04
☒	Test Receiver	R&S	ESCI 7	EC 4501	2020-09-11
☒	Climate chamber	GWS	MT3065	EC 6021	2020-07-04
☒	Spectrum Analyzer	Keysight	N9030A	EC 6078	2020-06-11
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2020-01-13
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-07-30
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-03-10
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2020-07-01

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
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

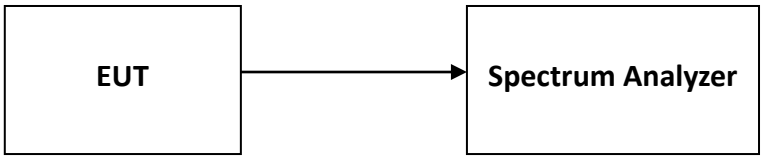
3.1 Limit

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

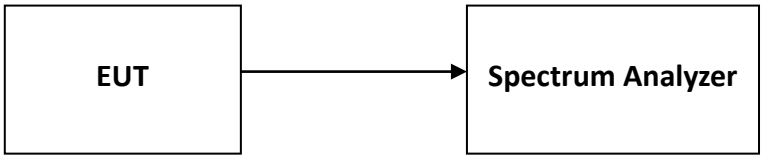
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

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

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

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.

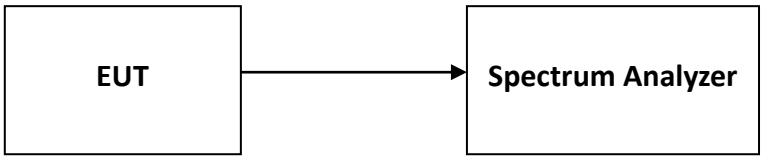
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

This procedure 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.

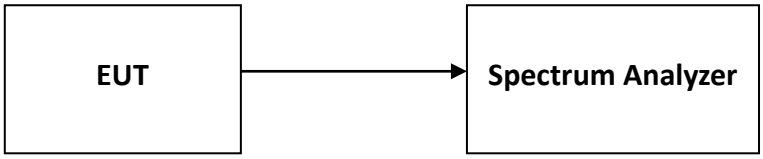
6.2 Measurement Procedure

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) 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, 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 (0.1 meters for floor standing) (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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.

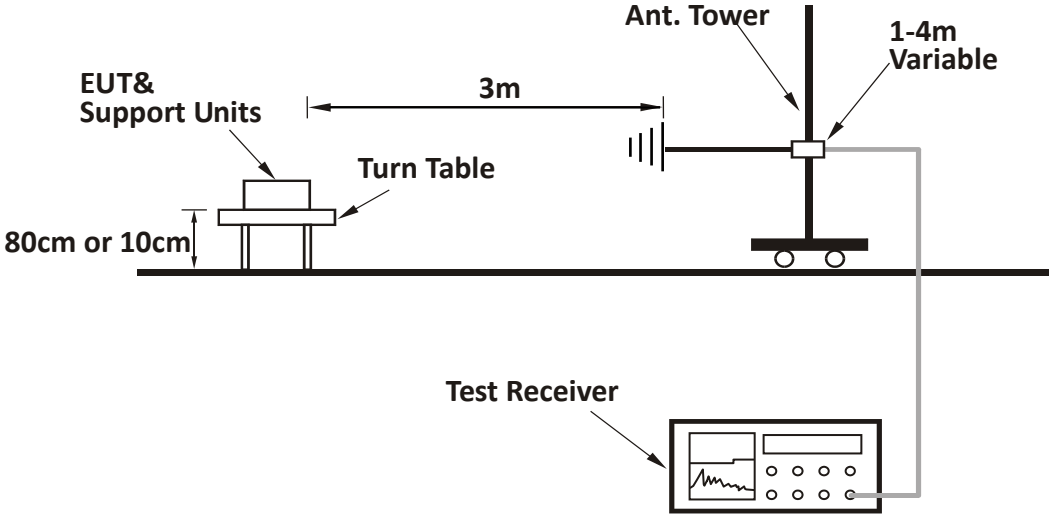
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

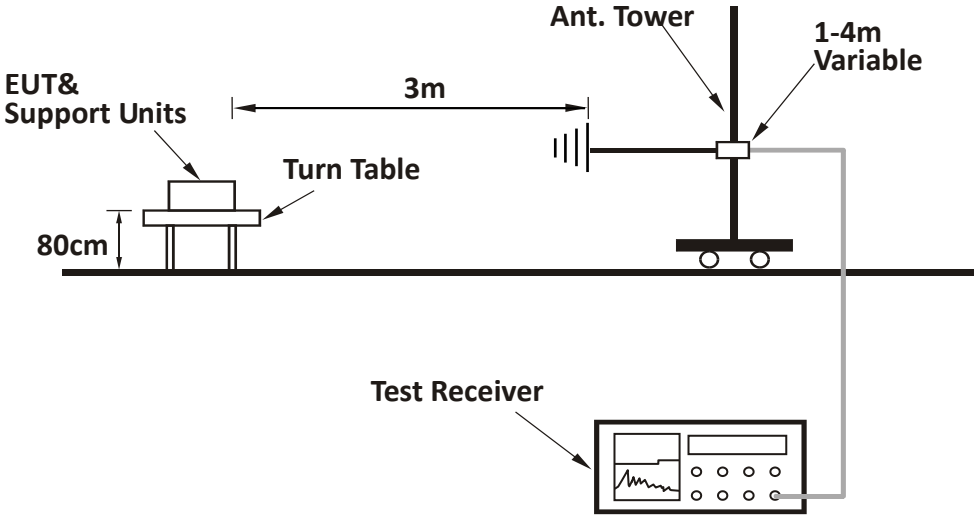
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

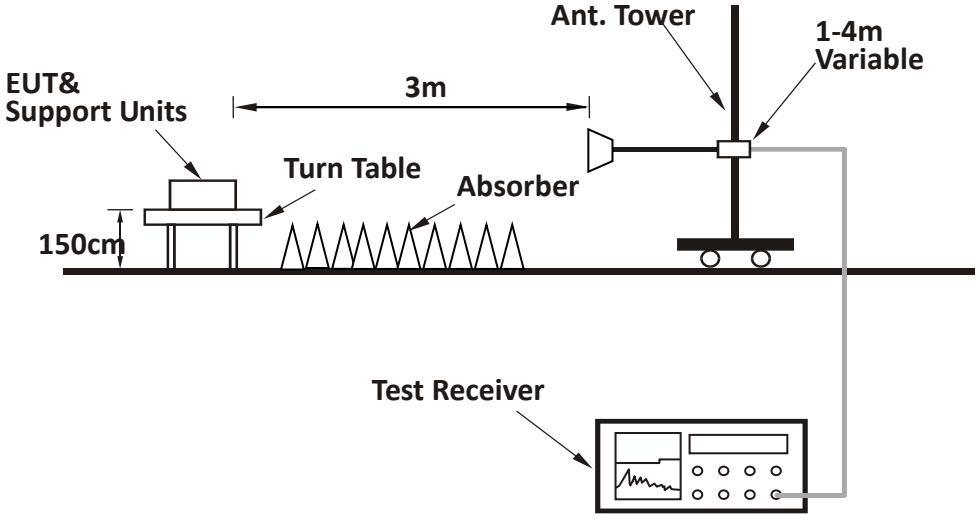
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



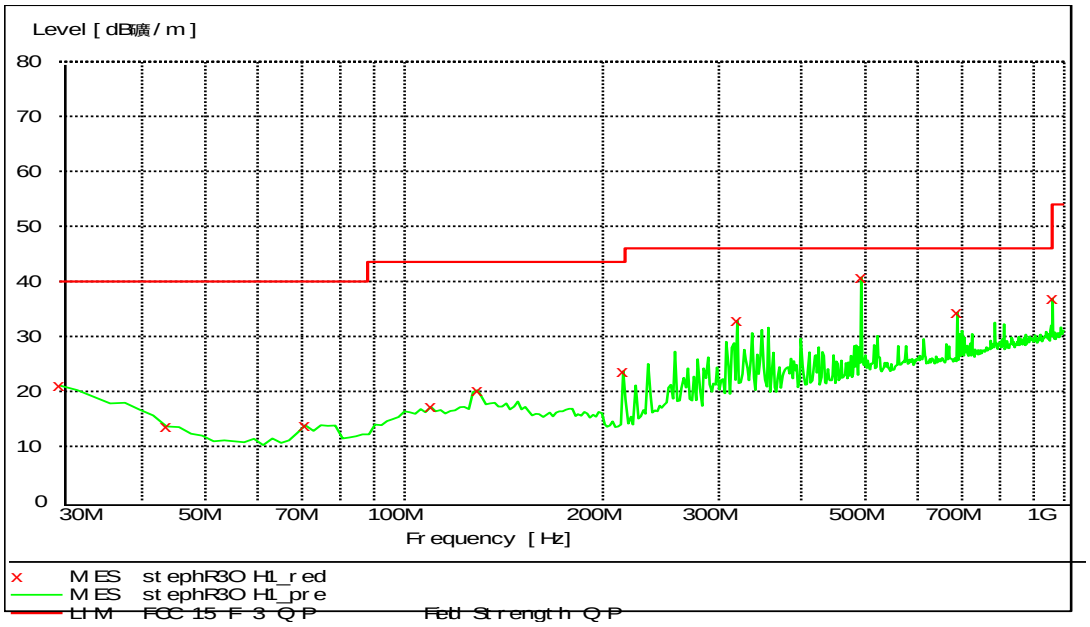
7.4 Test Results of Radiated Emissions

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.

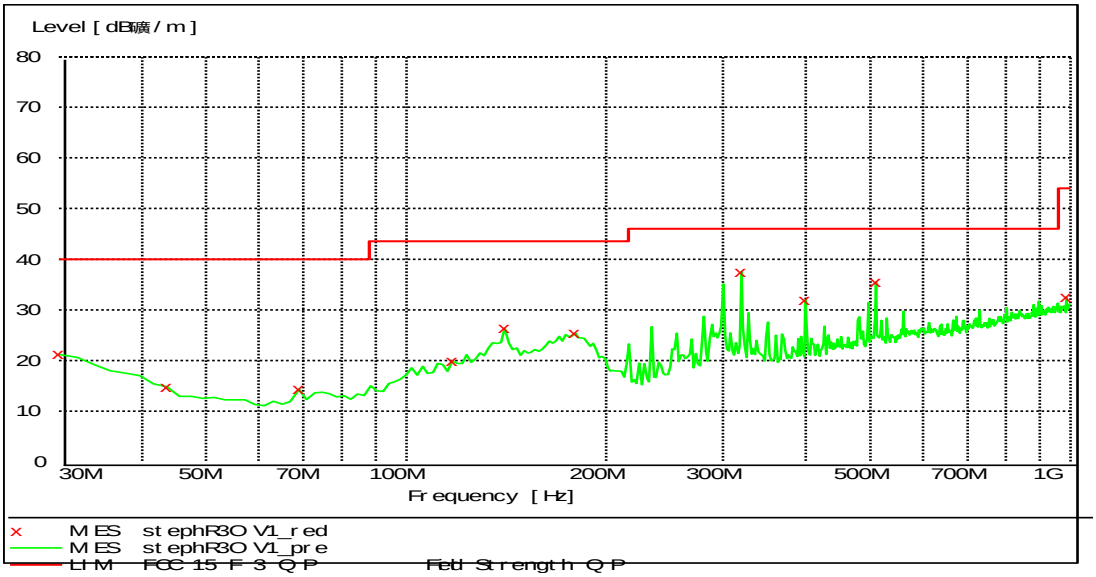
EUT was tested in mode 802.11b channel 2412MHz, which has the worst data and was listed in the report. The worst waveform from 30MHz to 1000MHz is listed as below:

R30 test curve:

Horizontal



Vertical

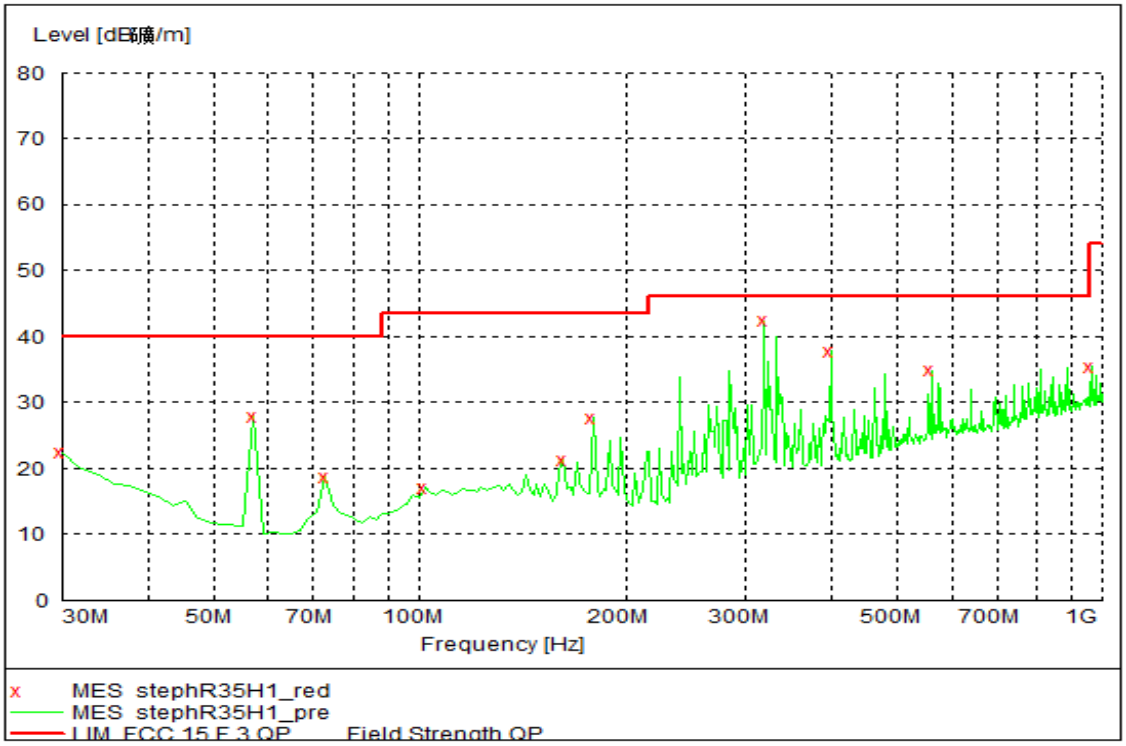


R30 Test data below 1GHz

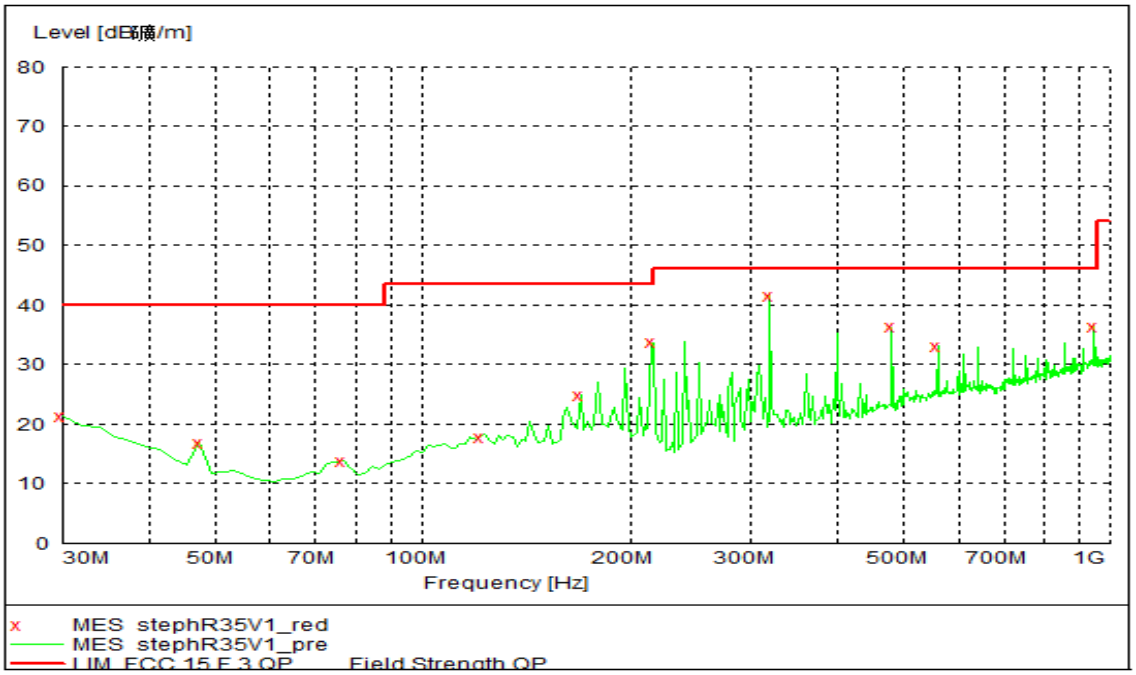
Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	21.00	18.80	40.00	19.00	PK
H	109.70	17.20	12.70	43.50	26.30	PK
H	214.67	23.70	10.90	43.50	19.80	PK
H	492.65	40.70	19.50	46.00	5.30	PK
H	688.98	34.30	21.50	46.00	11.70	PK
H	961.12	36.90	24.30	54.00	17.10	PK
V	30.00	21.20	18.80	40.00	18.80	PK
V	117.47	19.90	13.20	43.50	23.60	PK
V	179.68	25.40	10.60	43.50	18.10	PK
V	399.34	31.90	17.70	46.00	14.10	PK
V	510.14	35.50	19.80	46.00	10.50	PK
V	986.39	32.50	24.50	54.00	21.50	PK

R35 test curve:

Horizontal



Vertical



R35 Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.000	22.40	18.80	40.00	17.60	PK
H	72.766	18.70	7.50	40.00	21.30	PK
H	179.679	27.60	10.60	43.50	15.90	PK
H	319.639	42.40	15.60	46.00	3.60	PK
H	560.681	34.90	20.40	46.00	11.10	PK
H	961.122	35.40	24.30	54.00	18.60	PK
V	30.000	21.30	18.80	40.00	18.70	PK
V	76.653	13.80	7.70	40.00	26.20	PK
V	216.613	33.70	10.90	46.00	12.30	PK
V	319.639	41.60	15.60	46.00	4.40	PK
V	560.681	33.10	20.40	46.00	12.90	PK
V	945.571	36.30	24.20	54.00	17.70	PK

TEST REPORT

R30 Test result above 1GHz:
The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	56.20	74.00	17.80	PK
	H	2390.00	47.60	54.00	6.40	AV
	H	4202.40	40.90	74.00	33.10	PK
	V	4815.63	55.60	74.00	18.40	PK
	V	4815.63	48.2	54.00	5.80	AV
	V	9653.31	52.50	74.00	21.50	PK
	V	16705.41	49.30	74.00	24.70	PK
M	H	4236.47	40.70	74.00	33.30	PK
	V	9891.78	57.60	74.00	16.40	PK
	V	9891.78	48.00	54.00	6.00	AV
H	H	2483.50	56.60	74.00	17.40	PK
	H	2483.50	47.60	54.00	6.40	AV
	H	4100.20	40.30	74.00	33.70	PK
	V	4951.90	59.10	74.00	14.90	PK
	V	4951.90	49.80	54.00	4.20	AV
	V	7404.81	46.30	74.00	27.70	PK
	H	15921.84	50.90	74.00	23.10	PK

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	55.40	74.00	18.60	PK
	H	2390.00	46.10	54.00	7.90	AV
	H	4202.40	41.00	74.00	33.00	PK
	V	4815.63	50.30	74.00	23.70	PK

	H	7234.47	51.50	74.00	22.50	PK
	V	10062.12	46.20	74.00	27.80	PK
	V	15955.91	50.10	74.00	23.90	PK
M	H	4066.13	40.30	74.00	33.70	PK
	H	7404.80	46.30	74.00	27.70	PK
H	H	2483.50	57.60	74.00	16.40	PK
	H	2483.50	48.50	54.00	5.50	AV
	H	4951.90	54.20	74.00	19.80	PK
	H	4951.90	46.20	54.00	7.80	AV
	H	6587.17	43.60	74.00	30.40	PK
	H	7132.46	50.70	74.00	23.30	PK
	V	16194.39	49.20	74.00	24.80	PK
	V	17476.81	48.70	74.00	25.30	PK

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2390.00	55.80	74.00	18.20	PK
	V	2390.00	47.60	54.00	6.40	AV
	V	4815.63	55.60	74.00	18.40	PK
	V	4815.63	47.20	54.00	6.80	AV
	H	6587.17	43.60	74.00	30.40	PK
	H	7234.47	51.50	74.00	22.50	PK
	V	10062.12	46.20	74.00	27.80	PK
	H	15921.84	50.90	74.00	23.10	PK
	V	17166.91	48.70	74.00	25.30	PK
M	H	4236.47	40.70	74.00	33.30	PK
	H	9891.78	57.60	74.00	16.40	PK
	H	9891.78	49.40	54.00	4.60	AV
H	H	2483.50	56.90	74.00	17.10	PK

	H	2483.50	48.10	54.00	5.90	AV
	H	4100.20	40.30	74.00	33.70	PK
	H	4951.90	59.10	74.00	14.90	PK
	H	4951.90	50.70	54.00	3.30	AV
	H	7404.81	46.30	74.00	27.70	PK
	H	15921.84	50.90	74.00	23.10	AV
	V	16486.81	48.70	74.00	25.30	PK

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.

R35 Test result above 1GHz:
The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	56.20	74.00	17.80	PK
	H	2390.00	47.60	54.00	6.40	AV
	V	4814.63	61.70	74.00	12.30	PK
	V	4814.63	52.20	54.00	1.80	AV
	V	9665.33	58.90	74.00	15.10	PK
	V	9665.33	49.30	54.00	4.70	AV
M	H	4602.71	51.00	74.00	23.00	PK
	V	7428.36	56.80	74.00	17.20	PK
	V	7428.36	47.50	54.00	6.50	AV
H	H	2483.50	56.60	74.00	17.40	PK
	H	2483.50	47.60	54.00	6.40	AV
	V	4814.62	62.00	74.00	12.00	PK
	V	4814.62	52.80	54.00	1.20	AV
	V	7404.81	46.30	74.00	27.70	PK
	H	12067.13	50.40	74.00	23.60	PK

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	55.40	74.00	18.60	PK
	H	2390.00	46.10	54.00	7.90	AV
	H	4602.71	51.70	74.00	22.30	PK
	V	4817.35	59.30	74.00	14.70	PK
	V	4817.35	49.98	54.00	4.02	AV
	V	9665.33	58.40	74.00	15.60	PK

	V	9665.33	49.70	54.00	4.30	AV
M	H	4343.69	51.40	74.00	22.60	PK
	H	9877.25	53.80	74.00	20.20	PK
H	H	2483.50	57.60	74.00	16.40	PK
	H	2483.50	48.50	54.00	5.50	AV
	H	4932.36	58.60	74.00	15.40	PK
	H	4932.36	49.72	54.00	4.28	AV
	H	6587.17	43.60	74.00	30.40	PK
	H	9900.80	50.70	74.00	23.30	PK
	V	12274.34	49.20	74.00	24.80	PK
	V	15475.53	48.70	74.00	25.30	PK

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2390.00	55.80	74.00	18.20	PK
	V	2390.00	47.60	54.00	6.40	AV
	V	4844.37	60.00	74.00	16.00	PK
	V	4844.37	51.20	54.00	2.80	AV
	H	6745.50	46.50	74.00	27.50	PK
	H	7234.47	51.50	74.00	22.50	PK
	V	9806.12	46.20	74.00	27.80	PK
	H	12932.84	50.90	74.00	23.10	PK
	V	15156.91	48.70	74.00	25.30	PK
M	H	4236.47	40.70	74.00	33.30	PK
	H	9812.06	57.80	74.00	16.20	PK
	H	9812.06	49.20	54.00	4.80	AV
H	H	2483.50	56.90	74.00	17.10	PK
	H	2483.50	48.10	54.00	5.90	AV
	H	4108.22	51.20	74.00	22.80	PK

	H	4932.36	59.90	74.00	14.10	PK
	H	4932.36	50.20	54.00	3.80	AV
	H	7428.36	58.30	74.00	15.70	PK
	V	7428.36	49.80	54.00	4.20	PK
	V	9877.25	53.70	74.00	20.30	PK

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.

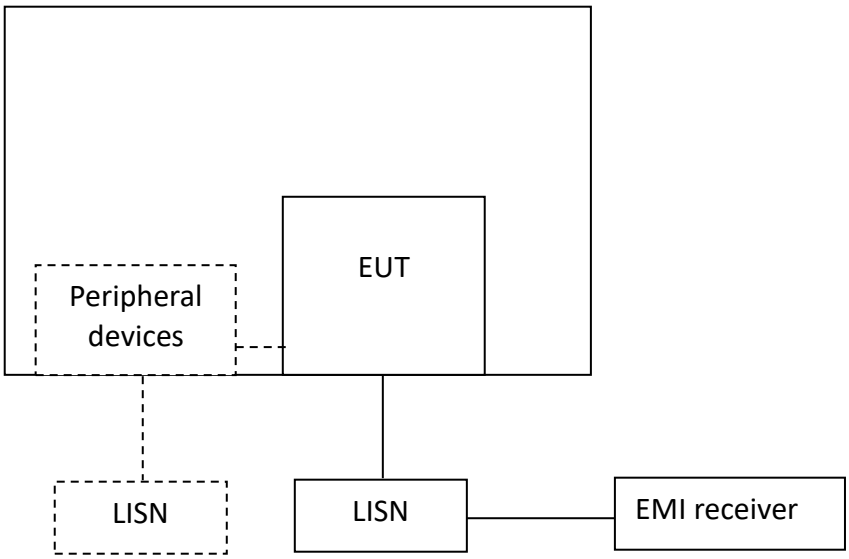
8 Power line conducted emission

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.

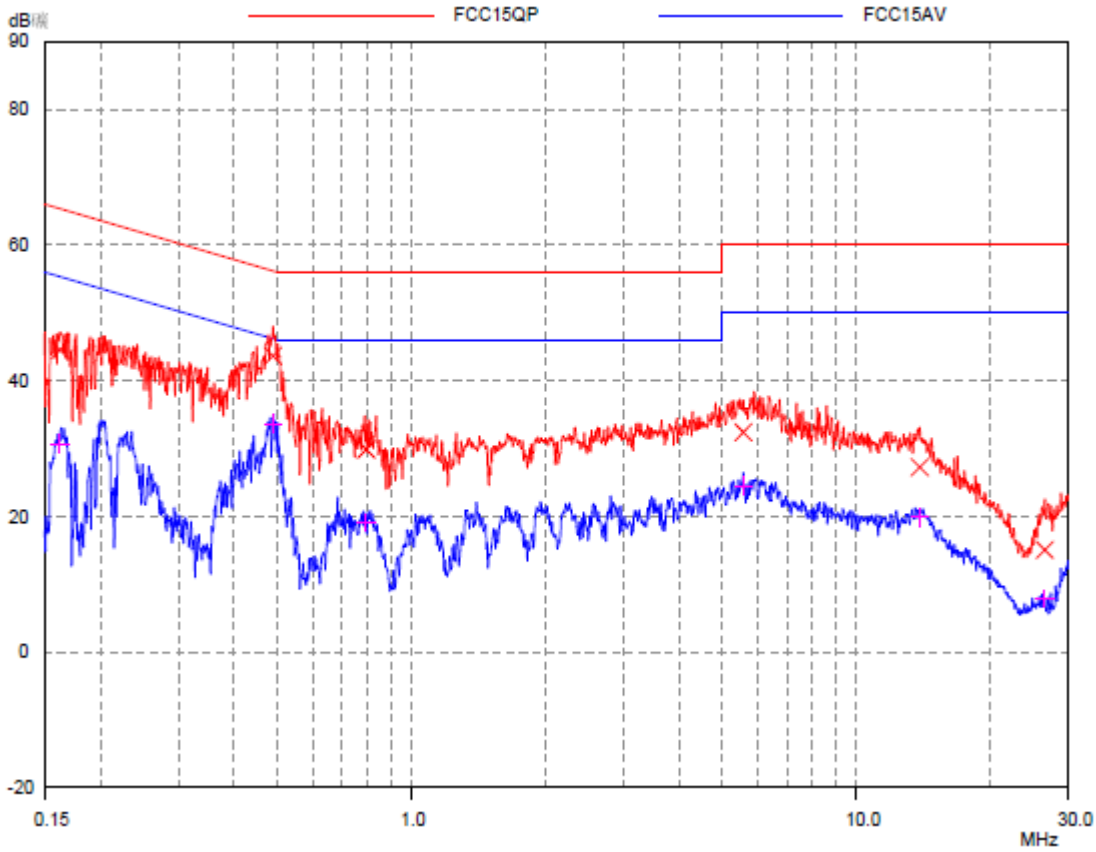
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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

R30 Test Curve:

L Line

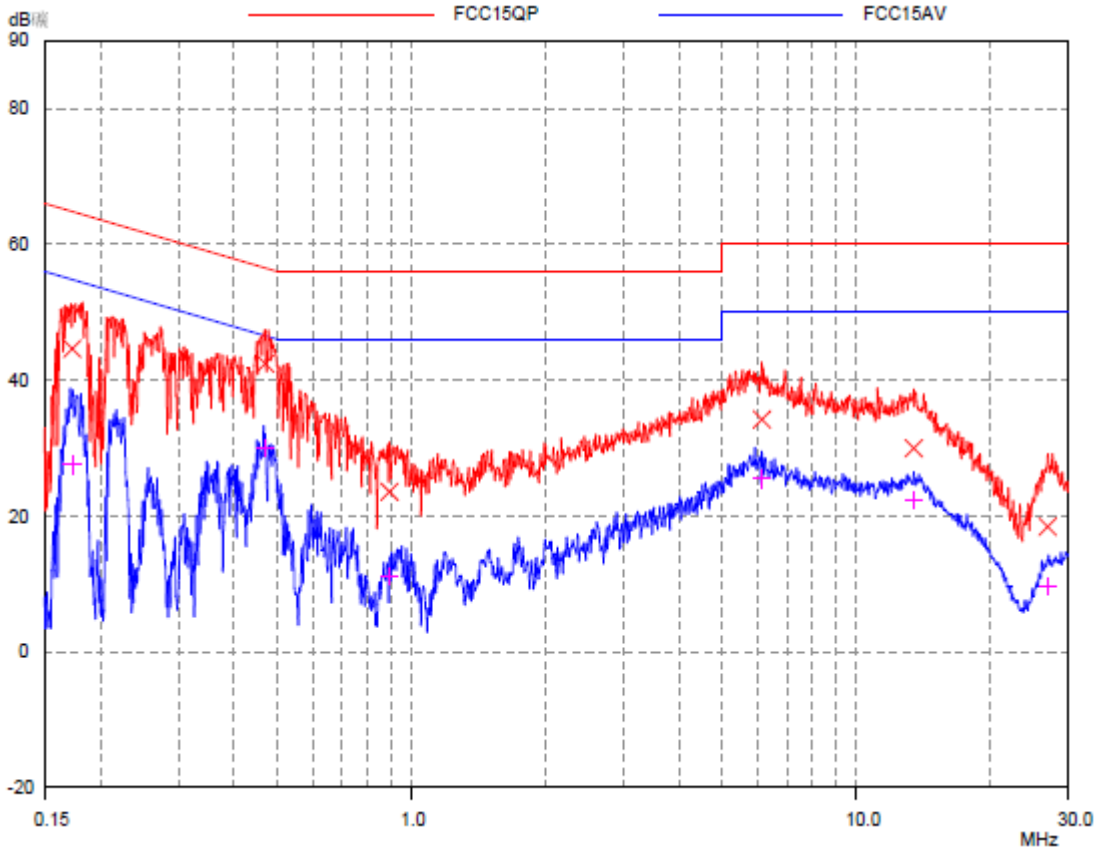


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.162	44.53	65.34	20.81	30.68	55.34	24.66
0.489	43.67	56.19	12.52	33.67	46.19	12.52
0.793	29.85	56.00	26.15	19.15	46.00	26.85
5.583	32.40	60.00	27.60	24.49	50.00	25.51
13.927	27.27	60.00	32.73	19.86	50.00	30.14
26.590	15.06	60.00	44.94	7.89	50.00	42.11

R30 Test Curve:

N Line



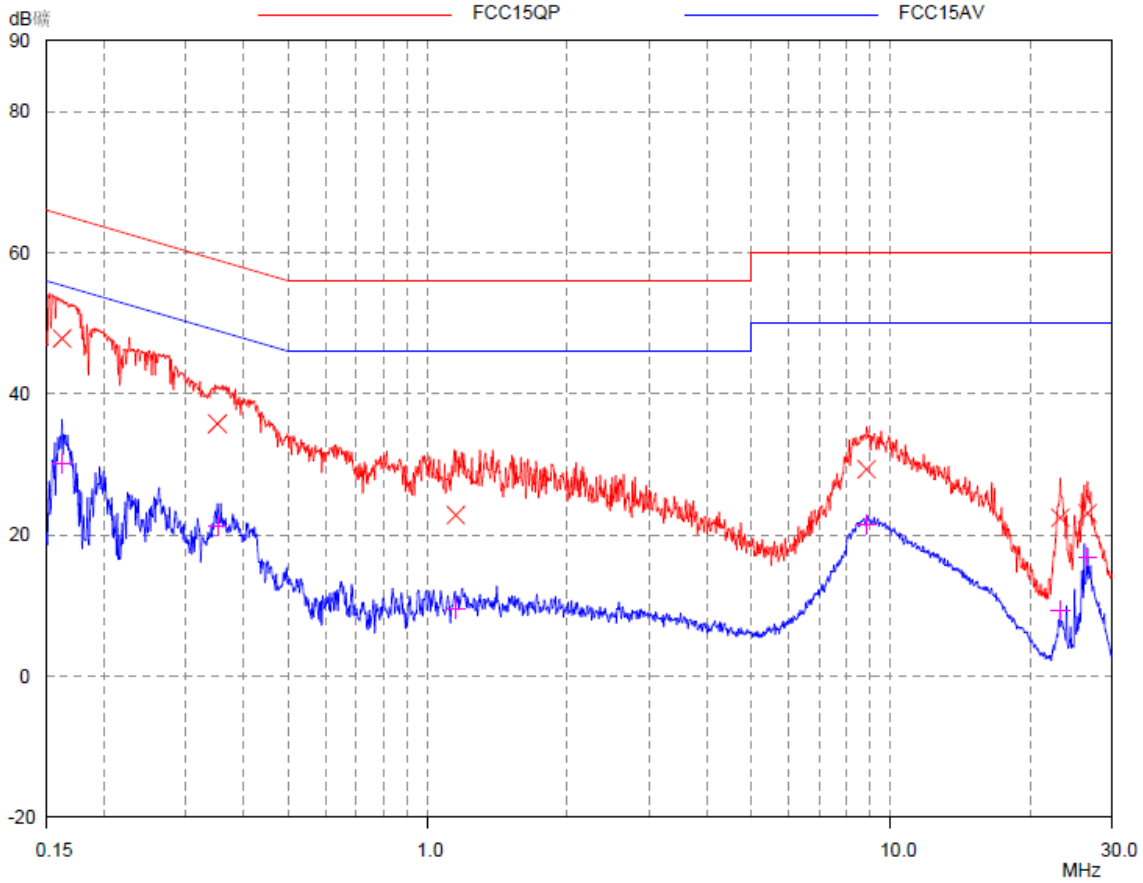
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.173	44.61	64.81	20.20	27.51	54.81	27.30
0.470	42.45	56.52	14.07	30.06	46.52	16.46
0.893	23.59	56.00	32.41	11.10	46.00	34.90
6.144	34.21	60.00	25.79	25.45	50.00	24.55
13.489	29.95	60.00	30.05	22.37	50.00	27.63
27.018	18.43	60.00	41.57	9.70	50.00	40.30

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.

R35 Test Curve:

L Line

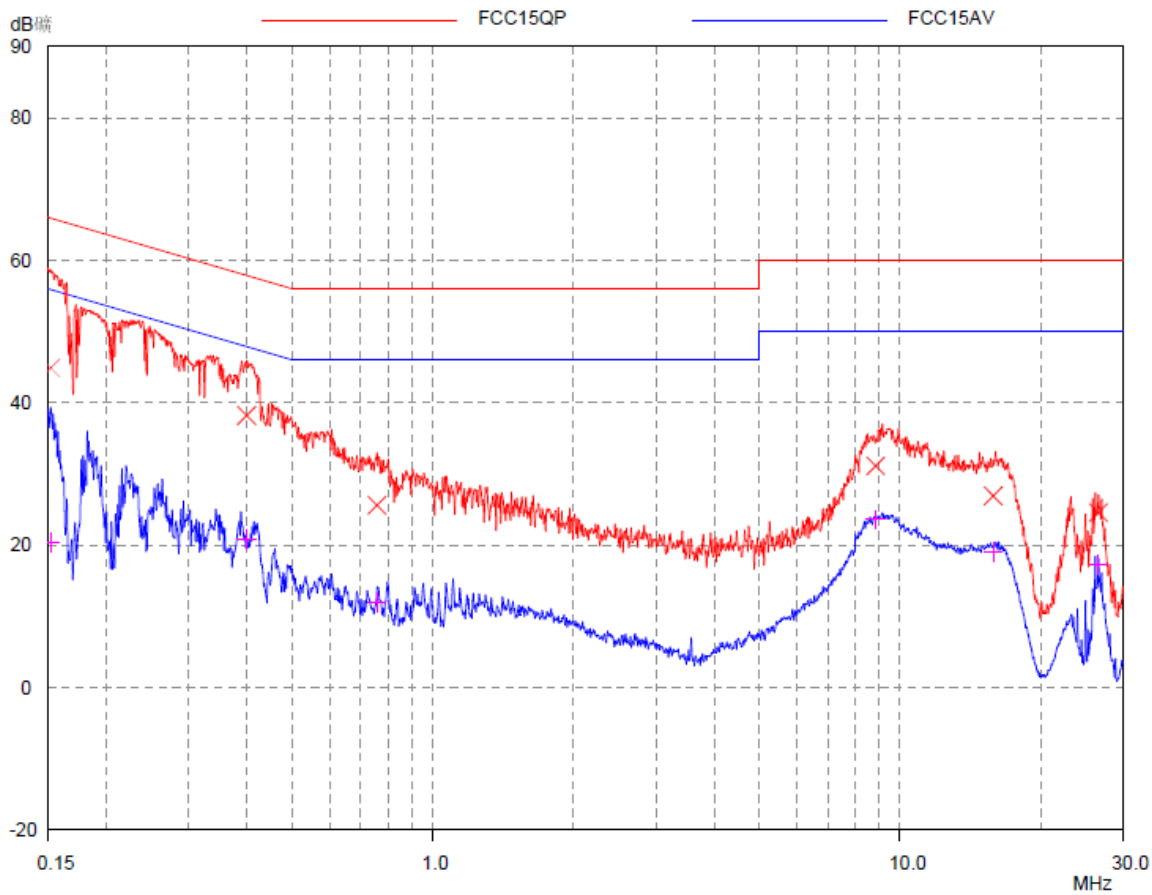


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.162	47.85	65.37	17.52	30.13	55.37	25.24
0.351	35.77	58.94	23.17	21.30	48.94	27.64
1.149	22.83	56.00	33.17	9.55	46.00	36.45
8.870	29.32	60.00	30.68	21.52	50.00	28.48
23.215	22.43	60.00	37.57	9.39	50.00	40.61
26.590	23.08	60.00	36.92	16.89	50.00	33.11

R35 Test Curve:

N Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.152	44.89	65.90	21.01	20.37	55.90	35.53
0.399	38.21	57.88	19.67	20.80	47.88	27.08
0.759	25.59	56.00	30.41	11.93	46.00	34.07
8.870	31.12	60.00	28.88	23.61	50.00	26.39
15.825	26.93	60.00	33.07	19.01	50.00	30.99
26.590	24.60	60.00	35.40	17.26	50.00	32.74

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

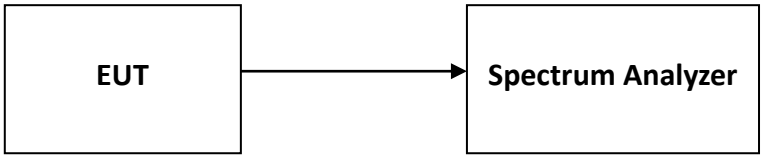
None

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

Appendix A: Test results

1. Minimum 6dB bandwidth

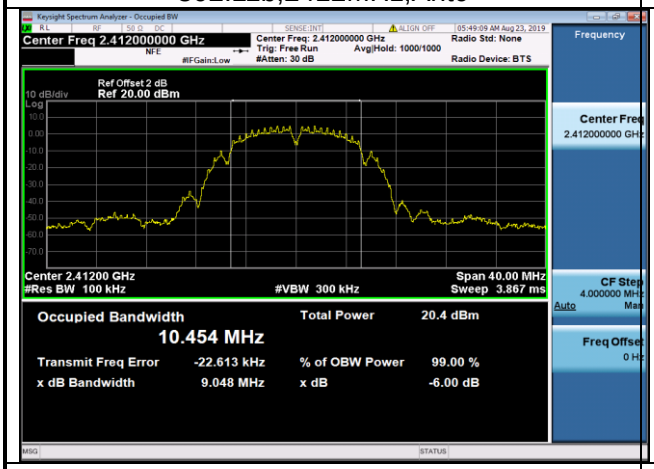
1.1 Test Data

WLAN Occupied 6dB Bandwidth				
Mode	Test Frequency (MHz)	Ant	Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	9.05	Pass
802.11b	2437	Ant0	8.10	Pass
802.11b	2462	Ant0	8.12	Pass
802.11g	2412	Ant0	16.33	Pass
802.11g	2437	Ant0	16.33	Pass
802.11g	2462	Ant0	16.34	Pass
802.11n (HT20)	2412	Ant0	16.59	Pass
802.11n (HT20)	2437	Ant0	16.58	Pass
802.11n (HT20)	2462	Ant0	16.60	Pass

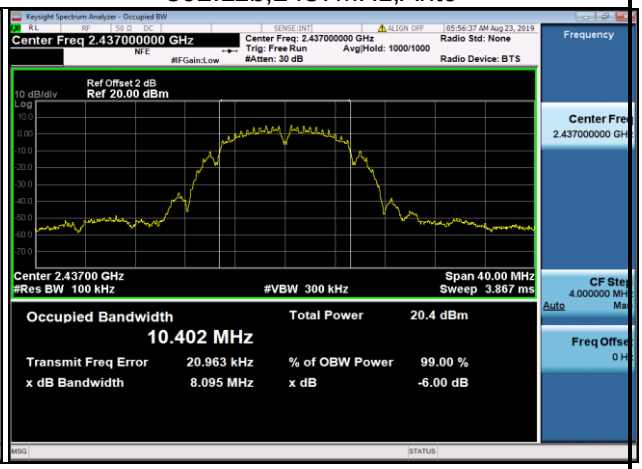
TEST REPORT

1.2 Test Plots

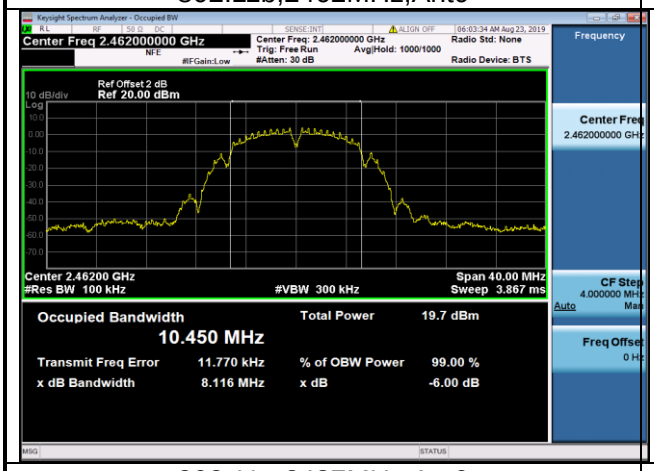
802.11b,2412MHz,Ant0



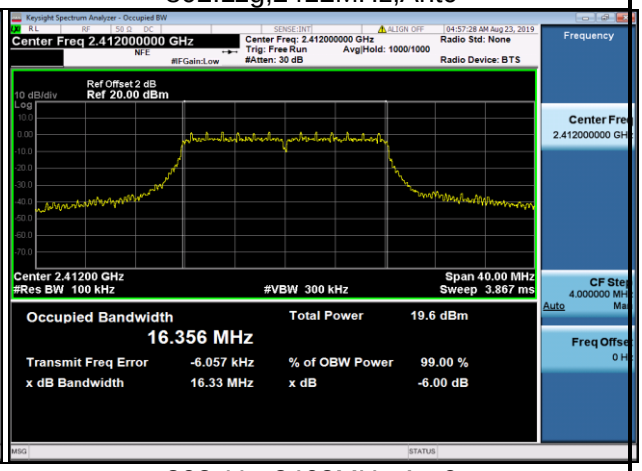
802.11b,2437MHz,Ant0



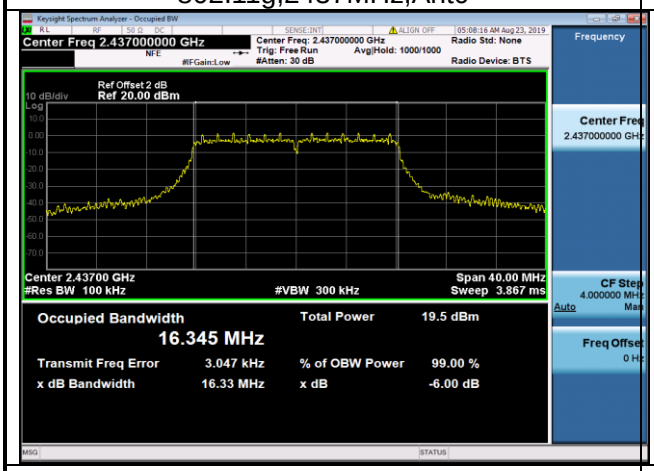
802.11b,2462MHz,Ant0



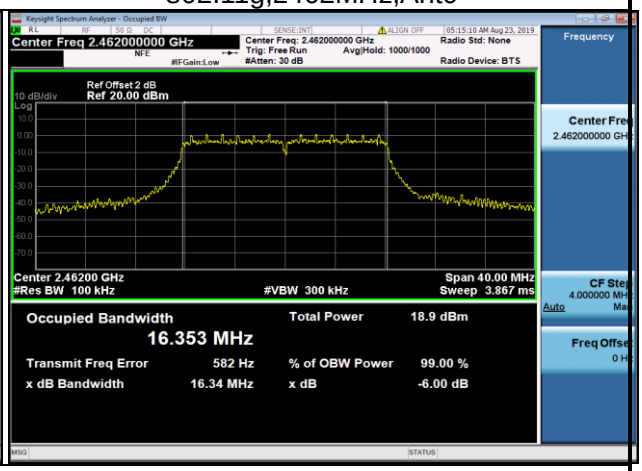
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

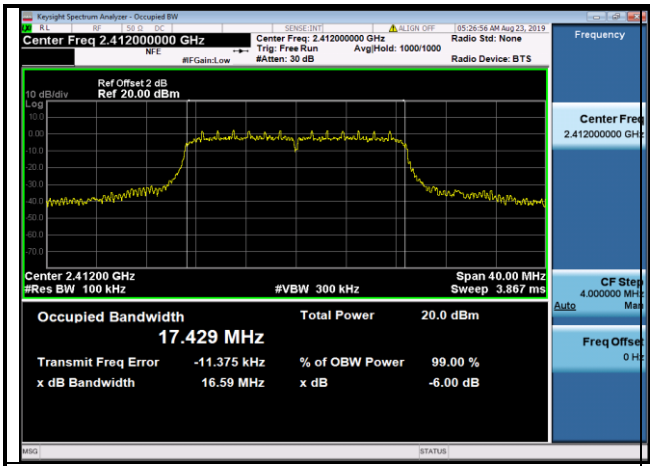


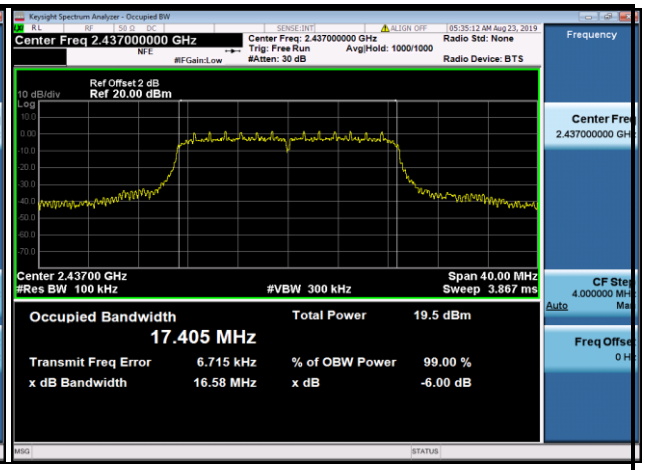
802.11g,2462MHz,Ant0



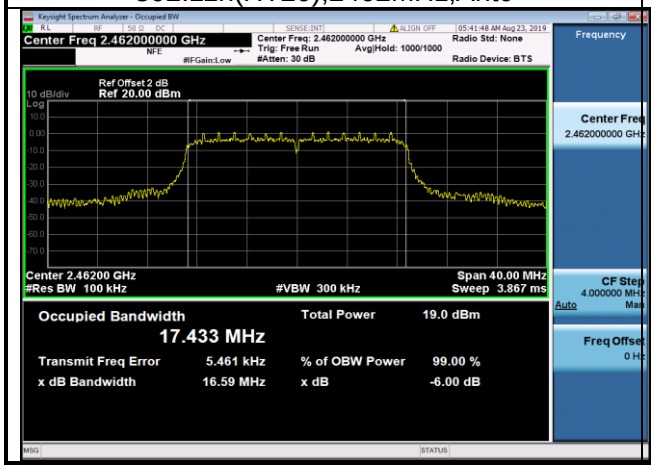
802.11n(HT20),2412MHz,Ant0

802.11n(HT20),2437MHz,Ant0





802.11n(HT20),2462MHz,Ant0



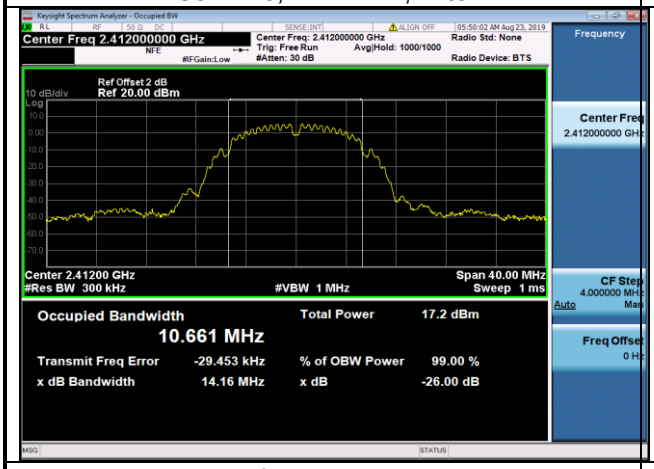
2. Occupied Bandwidth

2.1 Test Data

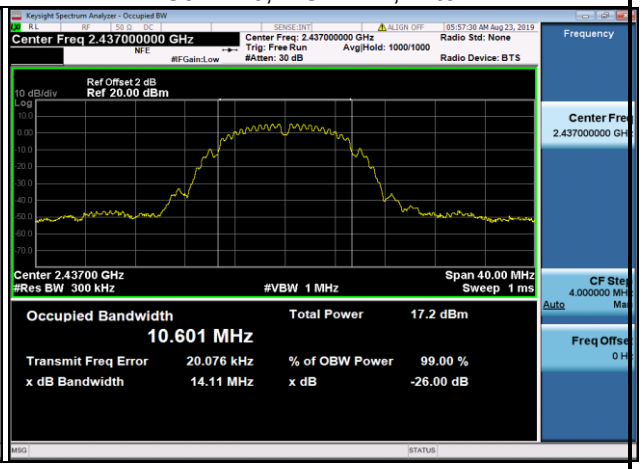
WLAN 99% Occupied Bandwidth				
Mode	Test Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	10.661	Pass
802.11b	2437	Ant0	10.601	Pass
802.11b	2462	Ant0	10.652	Pass
802.11g	2412	Ant0	16.577	Pass
802.11g	2437	Ant0	16.560	Pass
802.11g	2462	Ant0	16.590	Pass
802.11n (HT20)	2412	Ant0	17.510	Pass
802.11n (HT20)	2437	Ant0	17.477	Pass
802.11n (HT20)	2462	Ant0	17.511	Pass

2.2 Test Plots

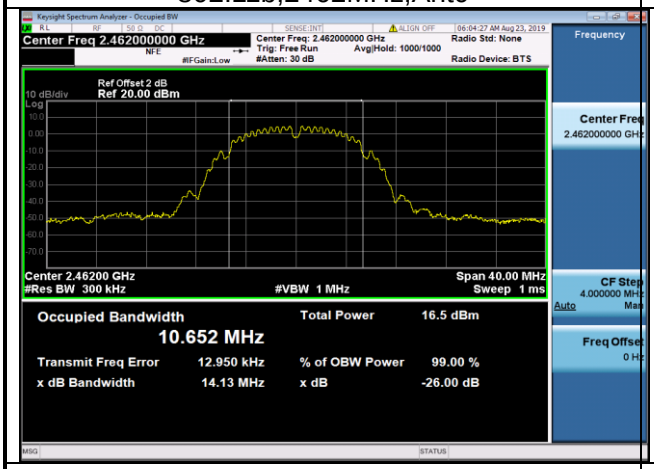
802.11b,2412MHz,Ant0



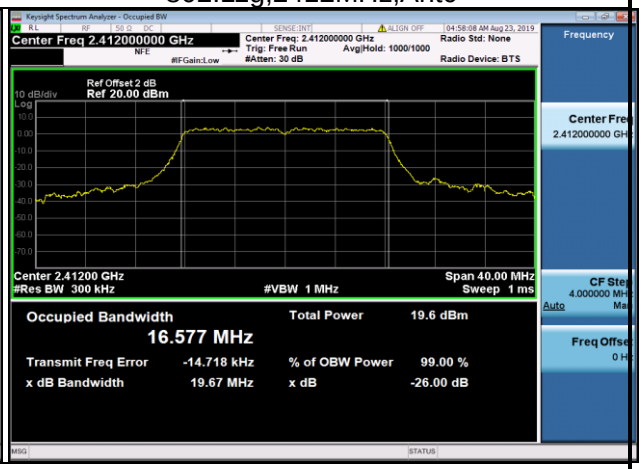
802.11b,2437MHz,Ant0



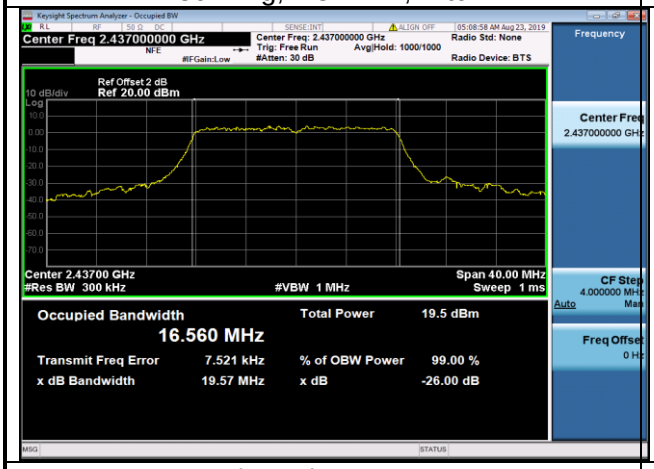
802.11b,2462MHz,Ant0



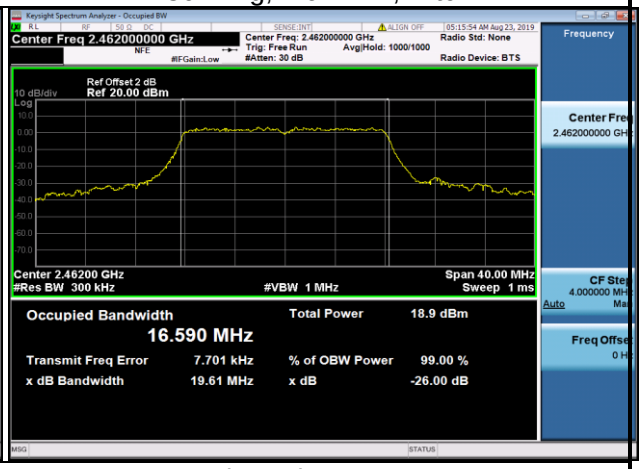
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

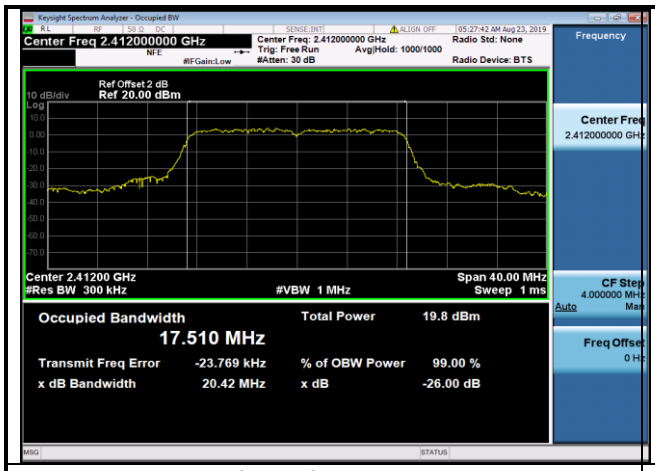


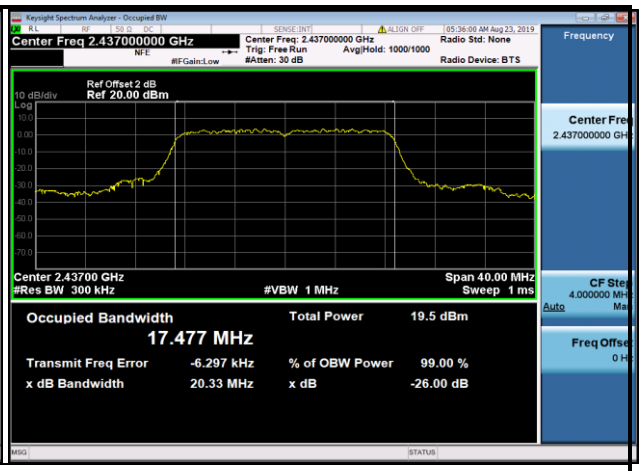
802.11g,2462MHz,Ant0



802.11n(HT20),2412MHz,Ant0

802.11n(HT20),2437MHz,Ant0





802.11n(HT20),2462MHz,Ant0

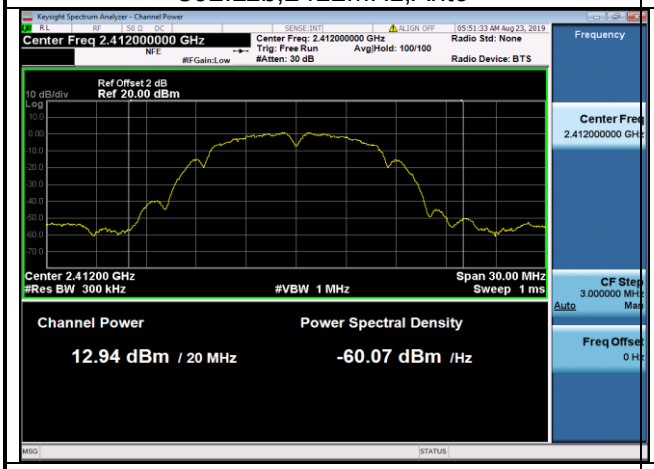
3. Maximum conducted output power and e.i.r.p

3.1 Test Data

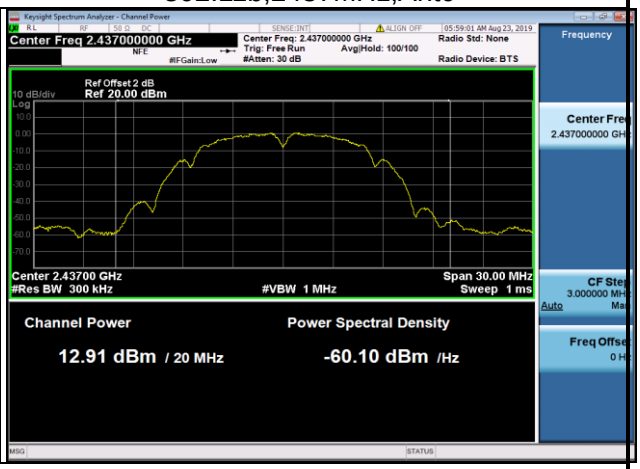
WLAN AVGSA Output Power							
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11b	2412	Ant0	0.50	13.44	30	15.44	Pass
802.11b	2437	Ant0	0.51	13.42	30	15.42	Pass
802.11b	2462	Ant0	0.51	12.74	30	14.74	Pass
802.11g	2412	Ant0	0.59	12.96	30	14.96	Pass
802.11g	2437	Ant0	0.64	13.04	30	15.04	Pass
802.11g	2462	Ant0	0.59	12.41	30	14.41	Pass
802.11n (HT20)	2412	Ant0	0.61	12.99	30	14.99	Pass
802.11n (HT20)	2437	Ant0	0.61	12.85	30	14.85	Pass
802.11n (HT20)	2462	Ant0	0.61	12.29	30	14.29	Pass

3.2 Test Plots

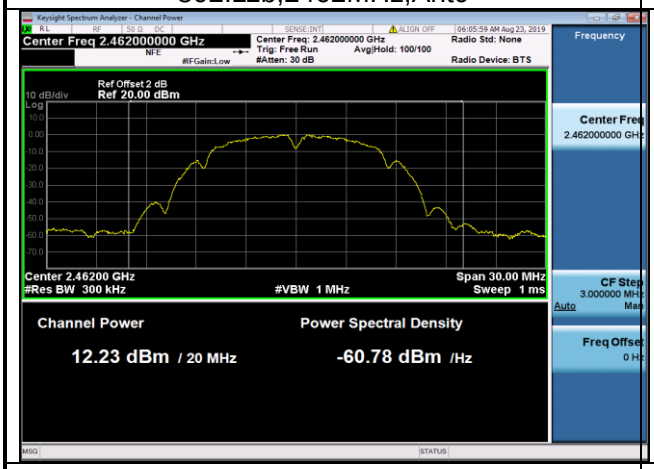
802.11b,2412MHz,Ant0



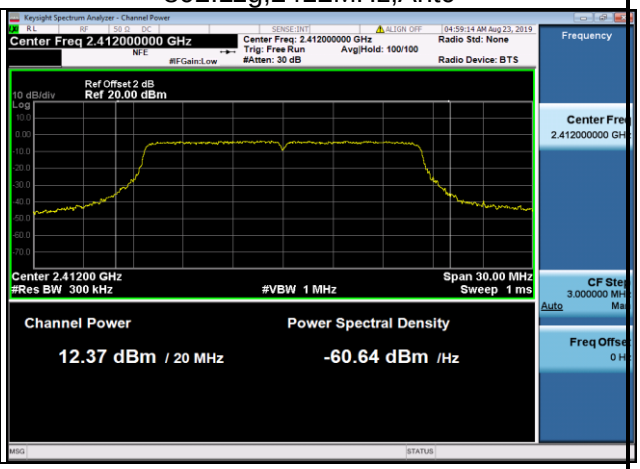
802.11b,2437MHz,Ant0



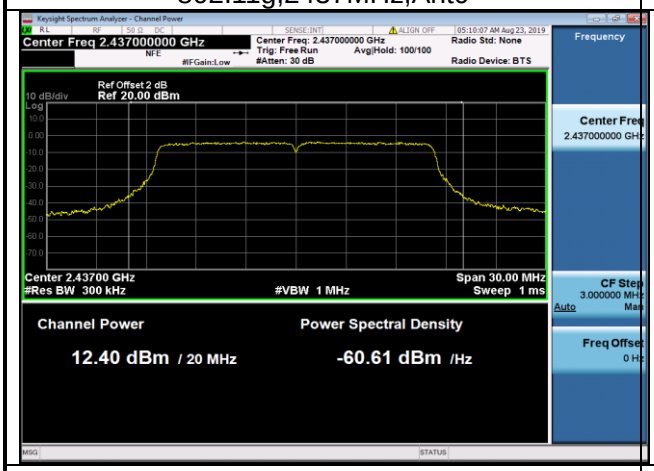
802.11b,2462MHz,Ant0



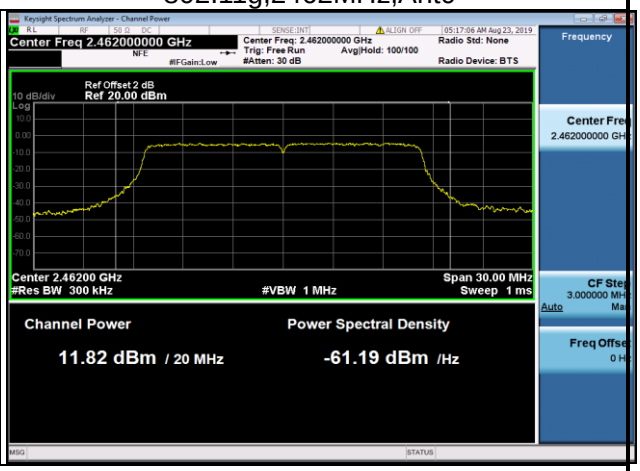
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

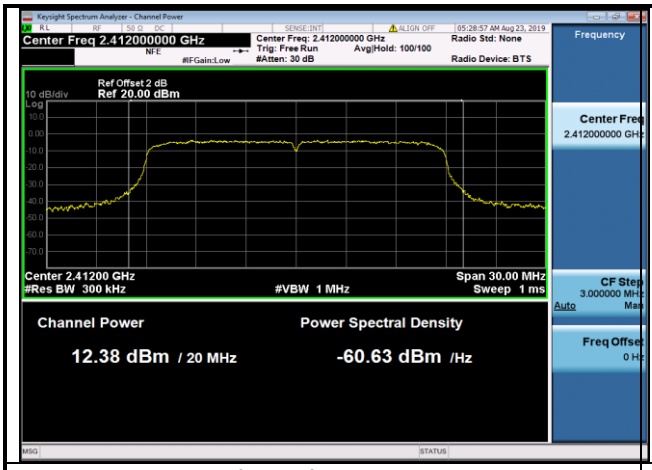


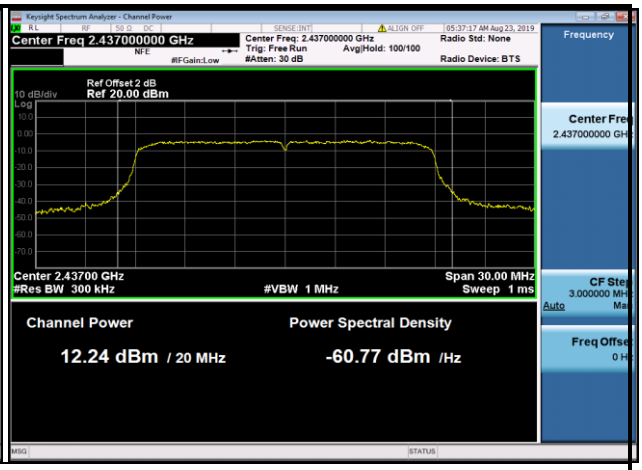
802.11g,2462MHz,Ant0



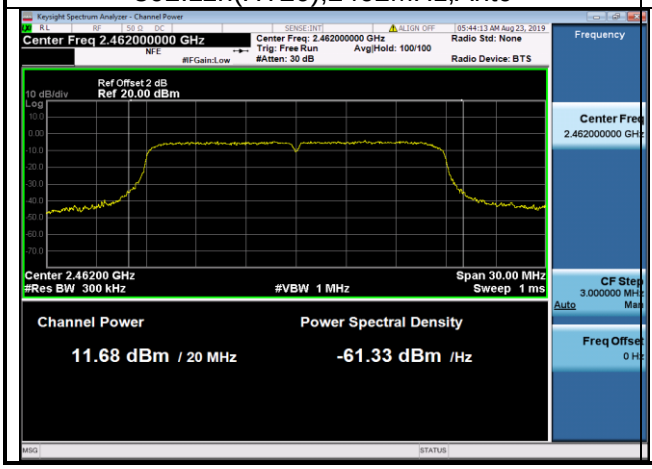
802.11n(HT20),2412MHz,Ant0

802.11n(HT20),2437MHz,Ant0





802.11n(HT20),2462MHz,Ant0



4. Power spectrum density

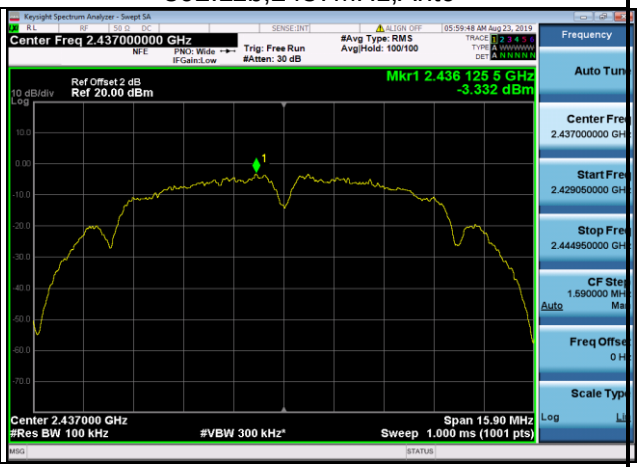
4.1 Test Data

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	0.50	-3.458	100	8	Pass
802.11b	2437	Ant0	0.51	-2.822	100	8	Pass
802.11b	2462	Ant0	0.51	-3.861	100	8	Pass
802.11g	2412	Ant0	0.59	-6.448	100	8	Pass
802.11g	2437	Ant0	0.64	-6.556	100	8	Pass
802.11g	2462	Ant0	0.59	-6.972	100	8	Pass
802.11n (HT20)	2412	Ant0	0.61	-6.100	100	8	Pass
802.11n (HT20)	2437	Ant0	0.61	-6.548	100	8	Pass
802.11n (HT20)	2462	Ant0	0.61	-7.330	100	8	Pass

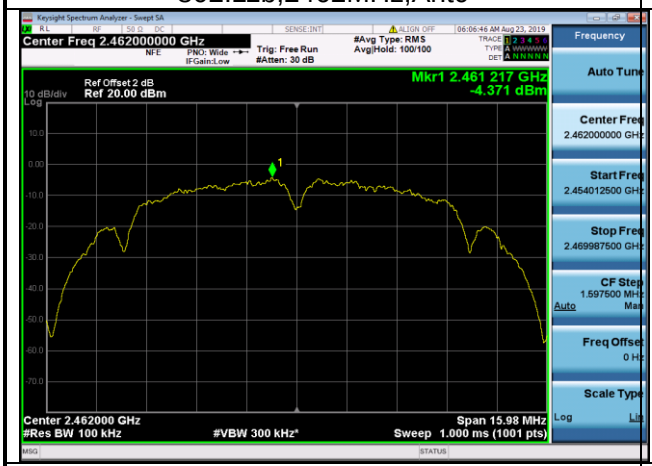
4.2 Test Plots

802.11b,2412MHz,Ant0

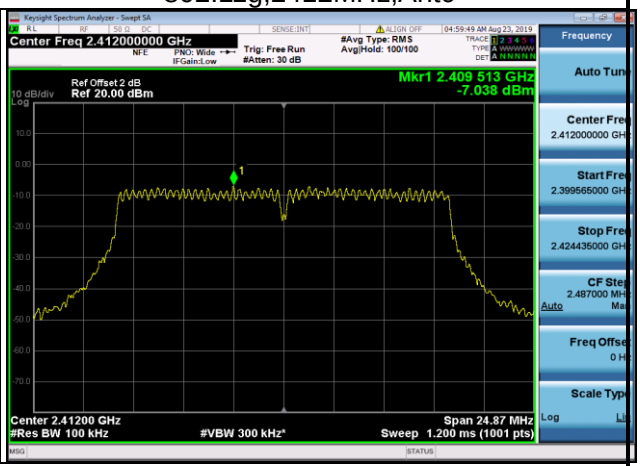
802.11b,2437MHz,Ant0



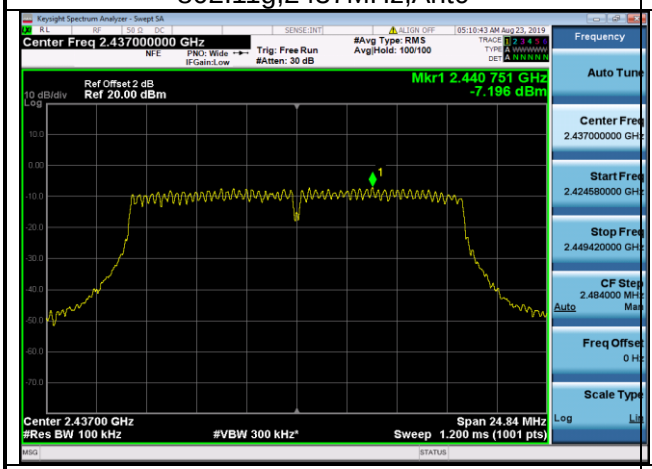
802.11b,2462MHz,Ant0



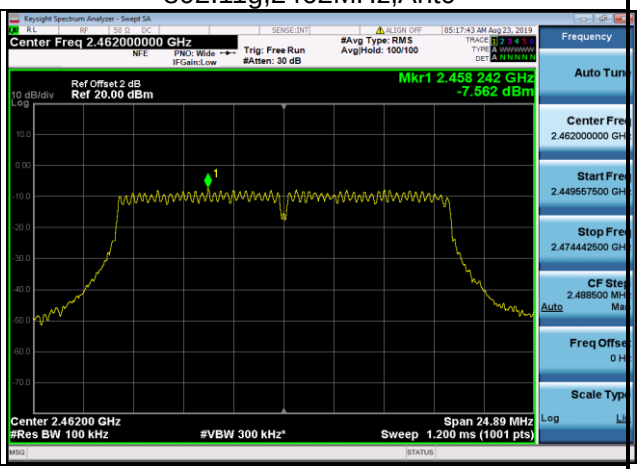
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

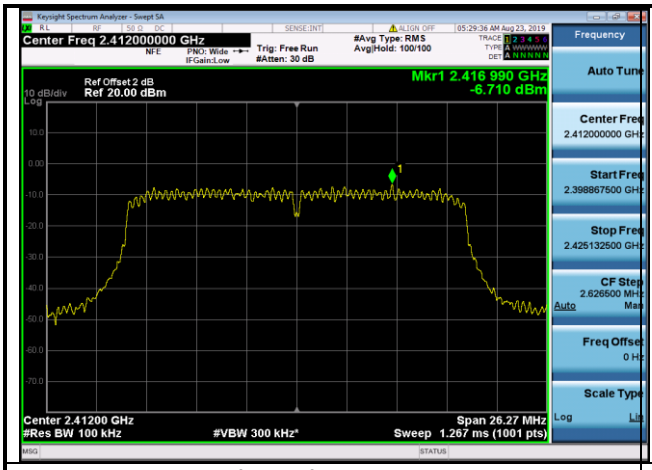


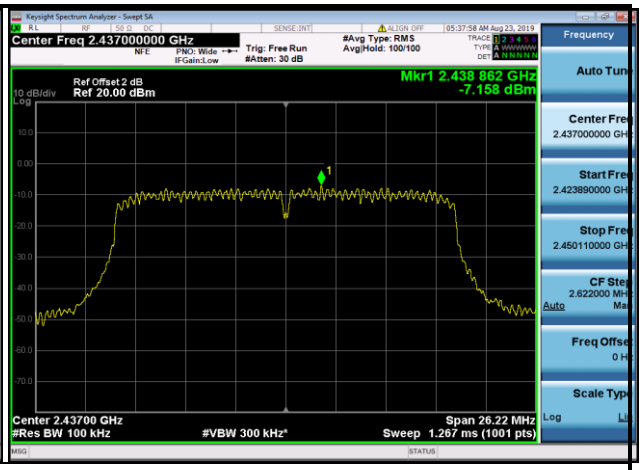
802.11g,2462MHz,Ant0



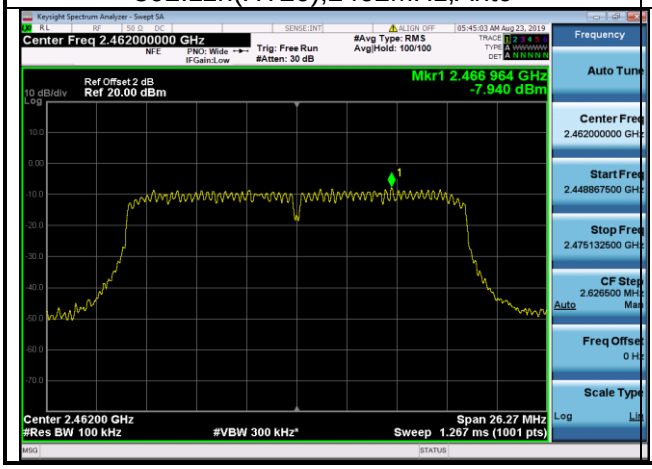
802.11n(HT20),2412MHz,Ant0

802.11n(HT20),2437MHz,Ant0





802.11n(HT20),2462MHz,Ant0



5. Emission outside the frequency band

5.1 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	5.05	Pass
802.11b	2412	Ant0	2	Band Edge	-47.44	Pass
802.11b	2412	Ant0	3	30MHz~2310MHz	-55.47	Pass
802.11b	2412	Ant0	4	2500MHz~5000MHz	-44.61	Pass
802.11b	2412	Ant0	5	5000MHz~25000MHz	-41.97	Pass
802.11b	2437	Ant0	1	Reference Level	4.68	Pass
802.11b	2437	Ant0	2	Band Edge	-54.96	Pass
802.11b	2437	Ant0	3	30MHz~2310MHz	-55.92	Pass
802.11b	2437	Ant0	4	2500MHz~5000MHz	-45.24	Pass
802.11b	2437	Ant0	5	5000MHz~25000MHz	-41.96	Pass
802.11b	2462	Ant0	1	Reference Level	4.29	Pass
802.11b	2462	Ant0	2	Band Edge	-53.81	Pass
802.11b	2462	Ant0	3	30MHz~2310MHz	-54.83	Pass
802.11b	2462	Ant0	4	2500MHz~5000MHz	-44.14	Pass
802.11b	2462	Ant0	5	5000MHz~25000MHz	-40.06	Pass
802.11g	2412	Ant0	1	Reference Level	1.57	Pass
802.11g	2412	Ant0	2	Band Edge	-35.77	Pass
802.11g	2412	Ant0	3	30MHz~2310MHz	-55.45	Pass
802.11g	2412	Ant0	4	2500MHz~5000MHz	-51.48	Pass
802.11g	2412	Ant0	5	5000MHz~25000MHz	-42.30	Pass
802.11g	2437	Ant0	1	Reference Level	1.53	Pass
802.11g	2437	Ant0	2	Band Edge	-54.08	Pass
802.11g	2437	Ant0	3	30MHz~2310MHz	-55.65	Pass
802.11g	2437	Ant0	4	2500MHz~5000MHz	-51.01	Pass
802.11g	2437	Ant0	5	5000MHz~25000MHz	-42.94	Pass
802.11g	2462	Ant0	1	Reference Level	0.77	Pass

802.11g	2462	Ant0	2	Band Edge	-44.59	Pass
802.11g	2462	Ant0	3	30MHz~2310MHz	-55.18	Pass
802.11g	2462	Ant0	4	2500MHz~5000MHz	-50.26	Pass
802.11g	2462	Ant0	5	5000MHz~25000MHz	-41.48	Pass
802.11n (HT20)	2412	Ant0	1	Reference Level	1.66	Pass
802.11n (HT20)	2412	Ant0	2	Band Edge	-33.38	Pass
802.11n (HT20)	2412	Ant0	3	30MHz~2310MHz	-55.49	Pass
802.11n (HT20)	2412	Ant0	4	2500MHz~5000MHz	-51.79	Pass
802.11n (HT20)	2412	Ant0	5	5000MHz~25000MHz	-41.78	Pass
802.11n (HT20)	2437	Ant0	1	Reference Level	1.56	Pass
802.11n (HT20)	2437	Ant0	2	Band Edge	-54.10	Pass
802.11n (HT20)	2437	Ant0	3	30MHz~2310MHz	-55.32	Pass
802.11n (HT20)	2437	Ant0	4	2500MHz~5000MHz	-51.26	Pass
802.11n (HT20)	2437	Ant0	5	5000MHz~25000MHz	-42.48	Pass
802.11n (HT20)	2462	Ant0	1	Reference Level	0.91	Pass
802.11n (HT20)	2462	Ant0	2	Band Edge	-44.21	Pass
802.11n (HT20)	2462	Ant0	3	30MHz~2310MHz	-55.90	Pass
802.11n (HT20)	2462	Ant0	4	2500MHz~5000MHz	-50.75	Pass
802.11n (HT20)	2462	Ant0	5	5000MHz~25000MHz	-41.71	Pass