

TEST REPORT

Applicant:	Guoguang Electric Co., Ltd.
Address of Applicant:	No.8 Jinghu Road, Xinhua Street, Huadu Reg, Guangzhou, China
Manufacturer:	Vifa Denmark A/S
Address of Manufacturer:	Mariendalsvej 2A, 8800 Viborg, Denmark
Factory:	Guoguang Electric Co.,Ltd
Address of Factory:	No.8 Jinghu Road, Xinhua Street, Huadu Reg, Guangzhou, China
Product name:	Active Wireless Speaker
Model:	VIFA012, VIFA022
Rating(s):	100-240V~ 50/60Hz; 160W
Trademark:	vifa
Standards:	47 CFR PART 15 Subpart C: 2016 section 15.247 RSS-247 Issue 1
FCC ID:	2AAP8-VIFANORDIC2
IC:	9043A-VIFANORDIC2
Data of Receipt:	2016-11-29
Date of Test:	2016-11-29~2016-12-30
Date of Issue:	2016-12-30
Test Result	Pass*

* In the configuration tested, the test item complied with the standards specified above.

Authorized for issue by:**Test by:****Reviewed by:**

Dec.30, 2016 Galen Xiao

Dec.30, 2016

Pauler Li

Project Engineer

Project Manager

Date

Name/Position

Signature

Date

Name/Position

Signature

Possible test case verdicts:

test case does not apply to the test object ...: N/A

test object does meet the requirement: P (Pass)

test object does not meet the requirement ...: F (Fail)

Testing Laboratory information:

Testing Laboratory Name: I-Test Laboratory

Address.....: 1-2 floor, South Block, Building A2 , No 3 Keyan Lu,
Science City, Guangzhou, Guangdong Province, P.R. China

Testing location : Same as above

Tel : 0086-20-32209330

Fax : 0086-20-62824387

E-mail : itl@i-testlab.com

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report would be invalid test report without all the signatures of testing technician and approver.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

General product information:

The Models VIFA012 and VIFA022 are identical to each other except for the model names, the size and power supply.

VIFA012: 268 mm / 362 mm / 90 mm; Powered by AC and Internal lithium battery

VIFA022: 215 mm / 1100 mm / 100 mm; Only power by AC

Unless otherwise specified, all tests were performed on the model VIFA012 as representatives.

1 Test Summary

Test	Test Requirement	Test method	Result
Antenna Requirement	FCC PART 15 C section 15.247 (c) and Section 15.203	FCC PART 15 C section 15.247 (c) and Section 15.203	PASS
Occupied Bandwidth (6dB and 99%)	FCC PART 15 C section 15.247 (a)(2) RSS 247 5.1(2)	ANSI C63.10:2013 Clause 6.9 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01	PASS
Maximum Peak Output Power	FCC PART 15 C section 15.247(b)(3) RSS 247 5.4(2)	ANSI C63.10: 2013 Clause 6.10 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01 (Power Output Option 2-Method #1).	PASS
Peak Power Spectral Density	FCC PART 15 C section 15.247(e)	ANSI C63.10:2013 Clause 6.11 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01 (PSD Option 1).	PASS
Conducted Spurious Emission (30MHz to 25GHz)	FCC PART 15 C section 15.209 &15.247(d) RSS 247 5.5	ANSI C63.10:2013 Clause 6.7 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01	PASS
Radiated Spurious Emission (30 MHz to 25 GHz)	FCC PART 15 C section 15.209 &15.247(d) RSS 247 5.5	ANSI C63.10:2013 Clause 6.4, 6.5 and 6.6 & KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01	PASS
Band Edges Measurement	FCC PART 15 C section 15.209 &15.247(d) RSS 247 5.5	ANSI C63.10:2013 Clause 6.9 & KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207 RSS GEN Table 2	ANSI C63.10:2013 Clause 6.2	PASS

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3 General Information

3.1 Client Information

Applicant: Guoguang Electric Co., Ltd.
Address of Applicant: No.8 Jinghu Road, Xinhua Street, Huadu Reg, Guangzhou, China

3.2 General Description of E.U.T.

Name: Active Wireless Speaker
Model No.: VIFA012
Trade Mark: vifa
Operating Frequency: 802.11 b/g/n(HT20): 2412MHz-2462MHz; 802.11 n(HT40): 2422MHz-2452MHz
802.11b, 802.11g, 802.11n(20MHz): 11

Working Frequency of Each Channel:			
channel	Frequency	channel	Frequency
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432		
6	2437		
7	2442		

Channels:

802.11n(40MHz): 7

Working Frequency of Each Channel:			
channel	Frequency	channel	Frequency
1	2422		
2	2427		
3	2432		
4	2437		
5	2442		
6	2447		
7	2452		

Modulation Technique: Frequency Hopping Spread Spectrum (FHSS)

Type of Modulation: CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM

Antenna Type: FPCB antenna

Antenna gain: 2.78dBi

Function: Active Wireless Speaker

3.3 Details of E.U.T.

EUT Power Supply: AC Power, Class II

Adapter: 100-240V~, 50/60Hz, 160W

Test mode: The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz,
TM2	802.11g	2412MHz, 2437MHz, 2462MHz,
TM3	802.11n(20MHz)	2412MHz, 2437MHz, 2462MHz,
TM4	802.11n(40MHz)	2422MHz, 2437MHz, 2452MHz,

Power cord: Direct plug

3.4 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

3.5 Test Location

All tests were performed at:

I-Test Laboratory

1-2 floor, South Block, Building A2 , No 3 Keyan Lu, Science City, Guangzhou, Guangdong Province, P.R. China

0086-20-32209330

itl@i-testlab.com

No tests were sub-contracted.

3.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

3.7 Abnormalities from Standard Conditions

None.

3.8 Other Information Requested by the Customer

None.

3.9 Test Facility

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

- CNAS(Lab code:L4957)
- FCC (Registration No.:935596)
- IC (Registration NO.:8368A)

3.10 Measurement Uncertainty

The below measurement uncertainties given below are based on a 95% confidence level (base on a coverage factor (k=2).)

Parameter	Uncertainty
Radio frequency	$\pm 1.06 \times 10^{-7}$
total RF power, conducted	1.37 dB
RF power density , conducted	2.89 dB
All emissions, radiated	± 3.35 dB
Temperature	± 0.23 °C
Humidity	± 0.3 %
DC and low frequency voltages	± 0.3 %

4 Instruments Used during Test

No.	Test Equipment	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due
ITL-114	Spectrum Analyzer	Agilent	N9010A	MY51250936	2016/01/25	2017/01/25
ITL-154	EMI test receiver 9kHz to 26.5GHz	R&S	ESR26	101257	2016/01/05	2017/01/05
ITL-116	Pre Amplifier	HP	8447F	3113A05905	2016/01/25	2017/01/25
ITL-117	Wideband Amplifier Super Ultra	Mini-circuits	ZVA-183- S+	469101134	2016/01/25	2017/01/25
ITL-105	Biconilog Antenna	ETS•Lindgren	3142D	00108096	2015/01/24	2018/01/24
ITL-110	Horn Antenna	A-INFOMW	JXTXLB- 10180-N	J2031090612 133	2015/01/24	2018/01/24
ITL-102	EMI Test receiver	R&S	ESCI	100910	2016/06/17	2017/06/17
ITL-103	Two-line v- network	R&S	ENV216	100120	2016/06/17	2017/06/17
ITL-115	50Ω Coaxial Cable	Mini-circuits	CBL	C001	2016/06/17	2017/06/17
ITL-100	Semi-Anechoic chamber	ETS•Lindgren	FACT3 2.0	CT09015	2014/06/17	2017/06/17
ITL-145	Loop Antenna	ZHINAN	ZN30900 A	002489	2016/01/25	2017/01/25
ITL-146	Horn Antenna	Schwarzbeck	BBHA 9170	B09806543	2016/06/17	2017/06/17
ITL-101	Shielded Room	ETS•Lindgren	8*4*3	CT09010	2015/03/09	2018/03/09

5 Test Results

5.1 E.U.T. test conditions

Test Voltage: AC 120V

Temperature: 23.2 -25.0 °C

Humidity: 38-50 % RH

Atmospheric Pressure: 1000 -1010 mbar

Requirements: **15.31(e):** For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

15.32: Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

Test frequencies and frequency range:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which	Number of	Location in frequency range
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Frequency range of radiated emission measurements

Lowest frequency generated	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz,
At or above 10 GHz to below	5th harmonic of highest fundamental frequency or to 100 GHz,
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz,

EUT channels and frequencies list:

Working Frequency of Each Channel:			
channel	Frequency	channel	Frequency
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432		
6	2437		
7	2442		

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz,
TM2	802.11g	2412MHz, 2437MHz, 2462MHz,
TM3	802.11n(20MHz)	2412MHz, 2437MHz, 2462MHz,
TM4	802.11n(40MHz)	2422MHz, 2437MHz, 2452MHz,

5.2 Antenna requirement

Standard requirement

15.203 requirement:

For intentional device. According to 15.203. 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.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna

The antenna is FPCB antenna and no consideration of replacement. The best case gain of the antenna is 2.78dBi.

Test result: The unit does meet the FCC requirements.

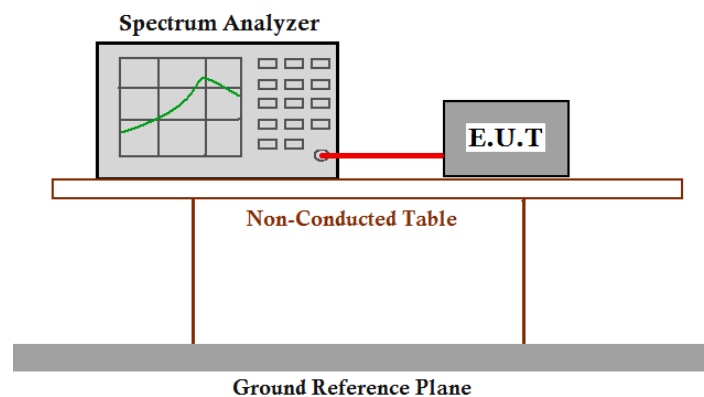
5.3 Occupied Bandwidth

Test Requirement: FCC Part 15 C section 15.247 and RSS 247
(a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Method: ANSI C63.10:2013 Clause 6.9 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Status: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (Cable loss =0.5dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW=100kHz. VBW = 300kHz, Sweep = auto; Detector Function = Peak. Trace = Max Hold, Set span to encompass the entire emission bandwidth of the signal.
3. Mark the peak power frequency and -6dB (upper and lower) power frequency.
4. Repeat until all the test status is investigated.
5. Report the worst case.

Test result (6 dB bandwidth)

Test Mode	Frequency (MHz)	Measured 6dB bandwidth (MHz)	Limit (kHz)	Result
802.11b	2412	5.17	≥500	Pass
	2437	5.99		Pass
	2462	6.17		Pass
802.11g	2412	16.74	≥500	Pass
	2437	16.85		Pass
	2462	16.86		Pass
802.11n(HT20)	2412	17.95	≥500	Pass
	2437	18.00		Pass
	2462	17.98		Pass
802.11n(HT40)	2412	37.21	≥500	Pass
	2437	37.05		Pass
	2452	37.06		Pass

Test result (99% bandwidth)

Test Mode	Frequency (MHz)	Measured 6dB bandwidth (MHz)	Limit (kHz)	Result
802.11b	2412	14.51	≥500	Pass
	2437	14.62		Pass
	2462	14.77		Pass
802.11g	2412	14.77	≥500	Pass
	2437	16.33		Pass
	2462	16.37		Pass
802.11n(HT20)	2412	17.49	≥500	Pass
	2437	17.49		Pass
	2462	17.51		Pass
802.11n(HT40)	2412	35.72	≥500	Pass
	2437	35.64		Pass
	2452	35.54		Pass

The unit does meet the FCC and RSS-247 requirements.

6dB bandwidth:

Result plot as follows:

802.11b

Channel 1:2.412GHz:



Channel 6:2.437GHz:



Channel 11:2.462GHz:



802.11g

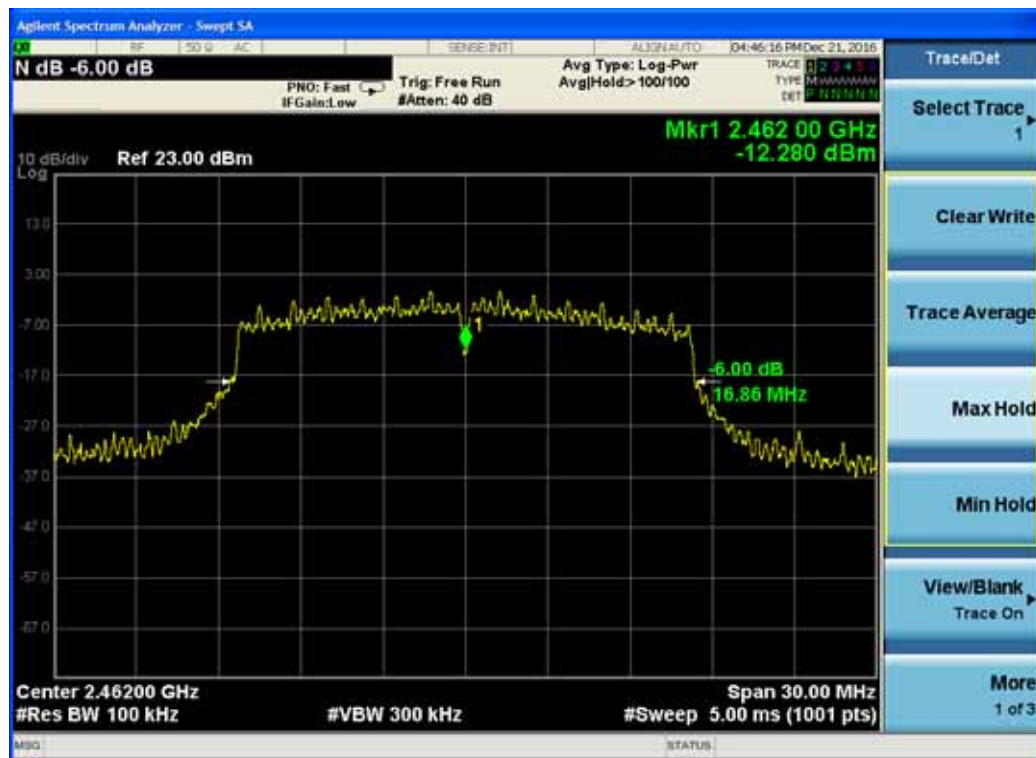
Channel 1:2.412GHz:



Channel 6:2.437GHz:



Channel 11:2.462GHz:



802.11n(HT20)

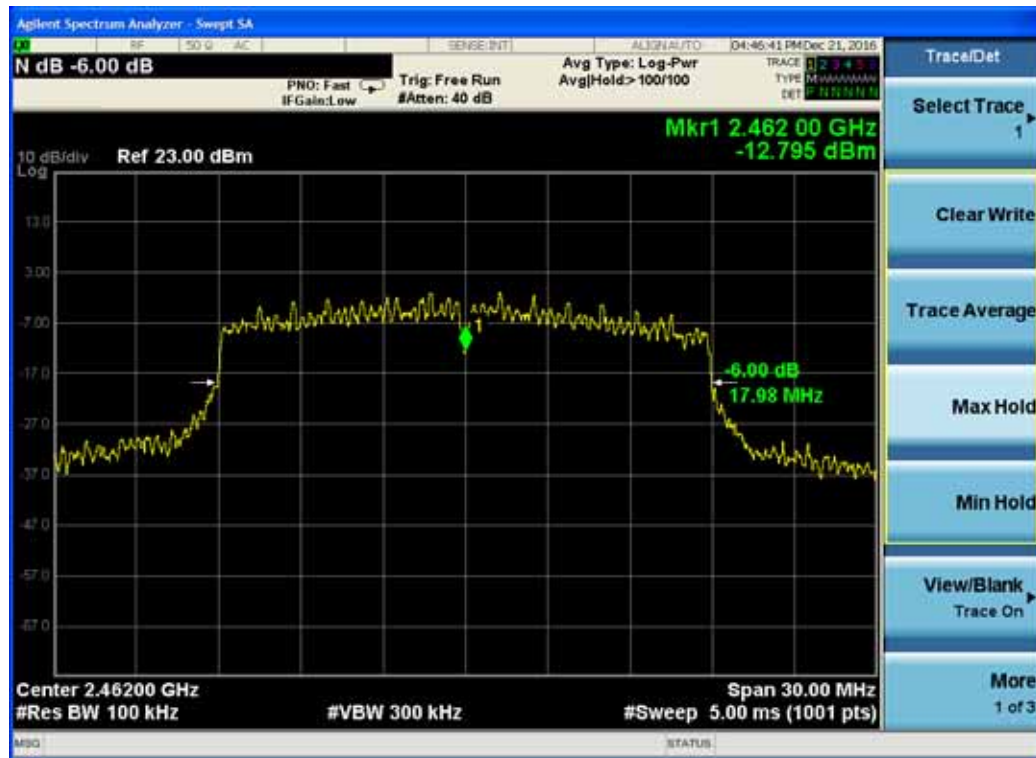
Channel 1:2.412GHz:



Channel 6:2.437GHz:

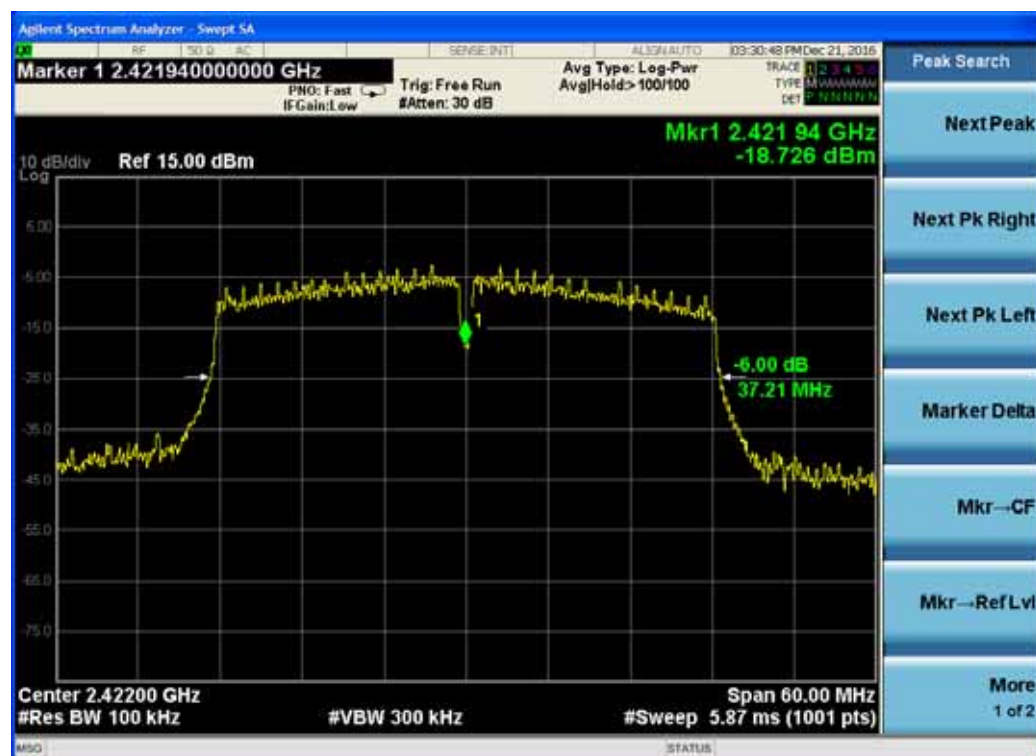


Channel 11:2.462GHz:

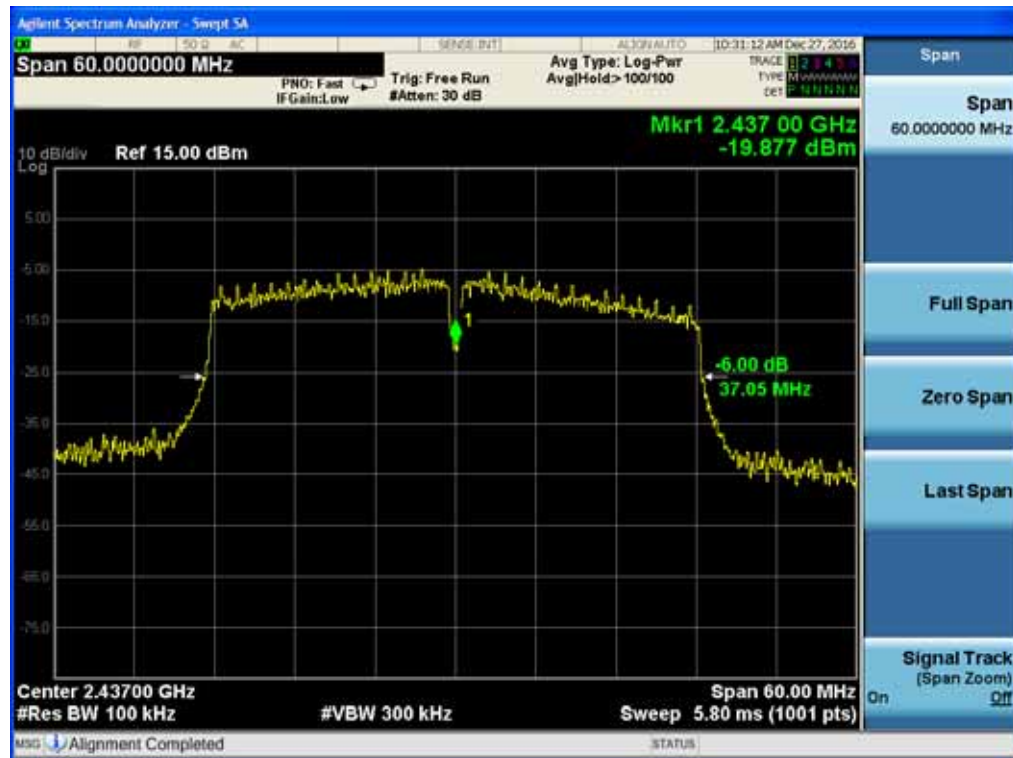


802.11n(HT40)

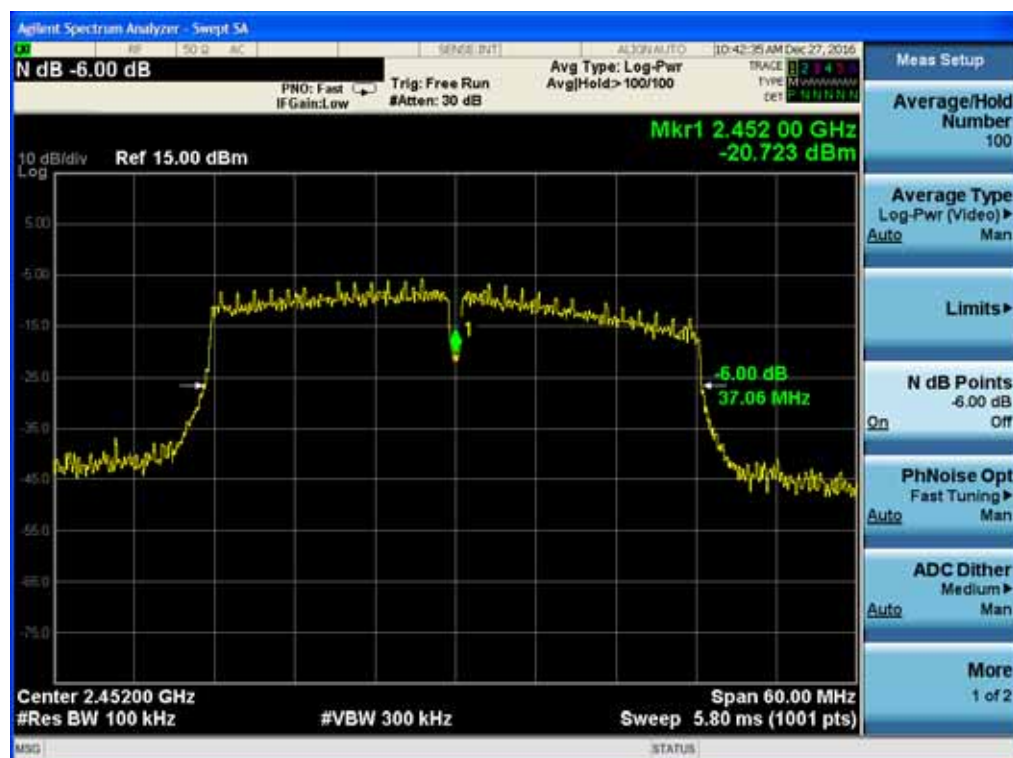
Channel 1:2.422GHz:



Channel 4:2.437GHz:



Channel 7:2.452GHz:



99% bandwidth:

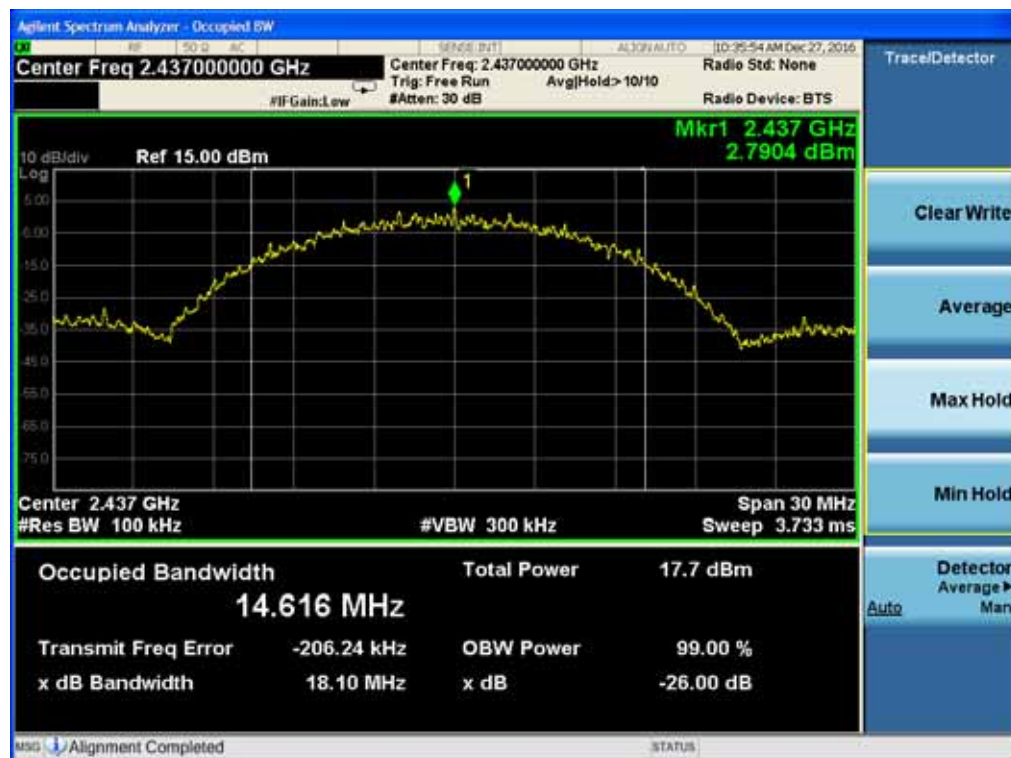
Result plot as follows:

802.11b

Channel 1:2.412GHz:



Channel 6:2.437GHz

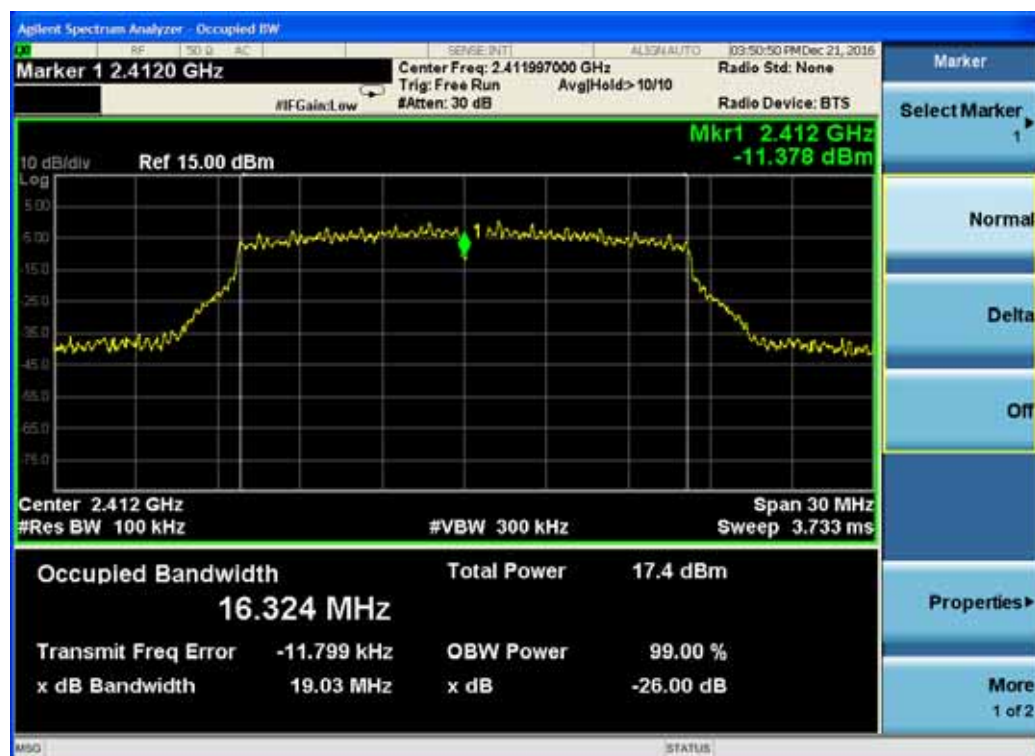


Channel 11:2.462GHz:

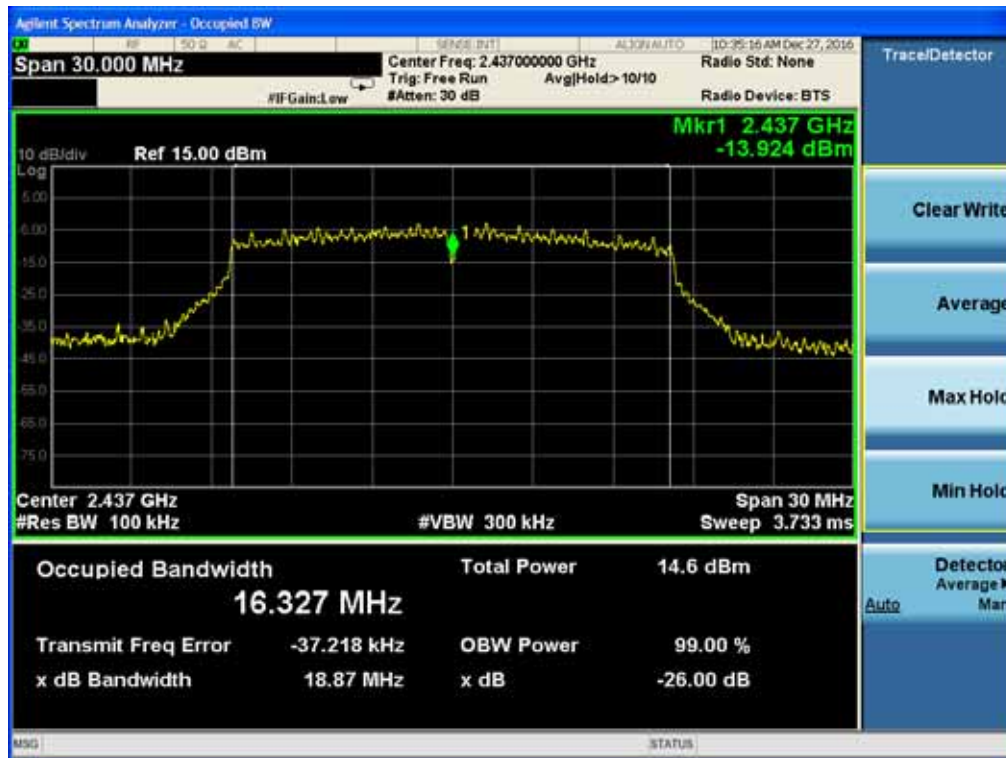


802.11g

Channel 1:2.412GHz:



Channel 6:2.437GHz



Channel 11:2.462GHz:

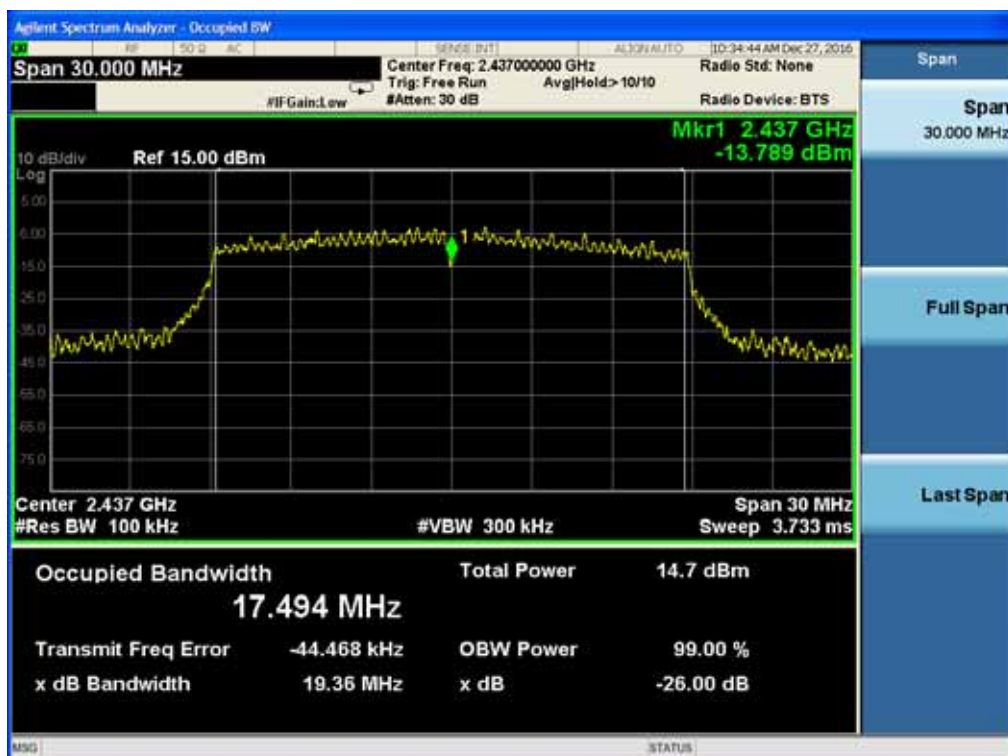


802.11n(HT20)

Channel 1:2.412GHz:



Channel 6:2.437GHz

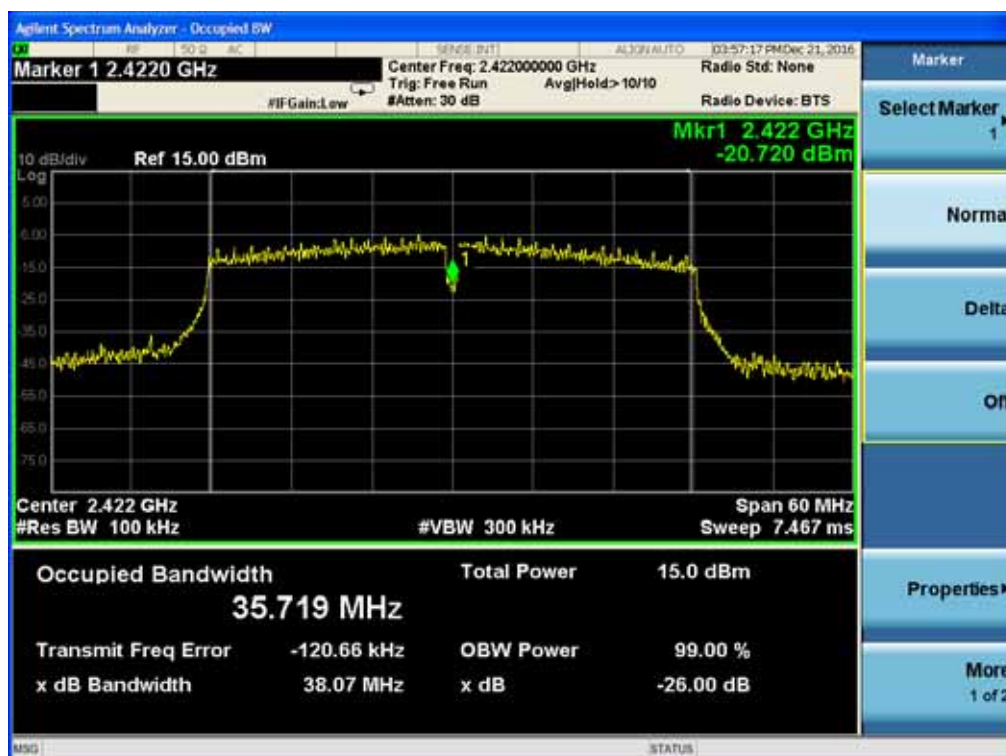


Channel 11:2.462GHz:

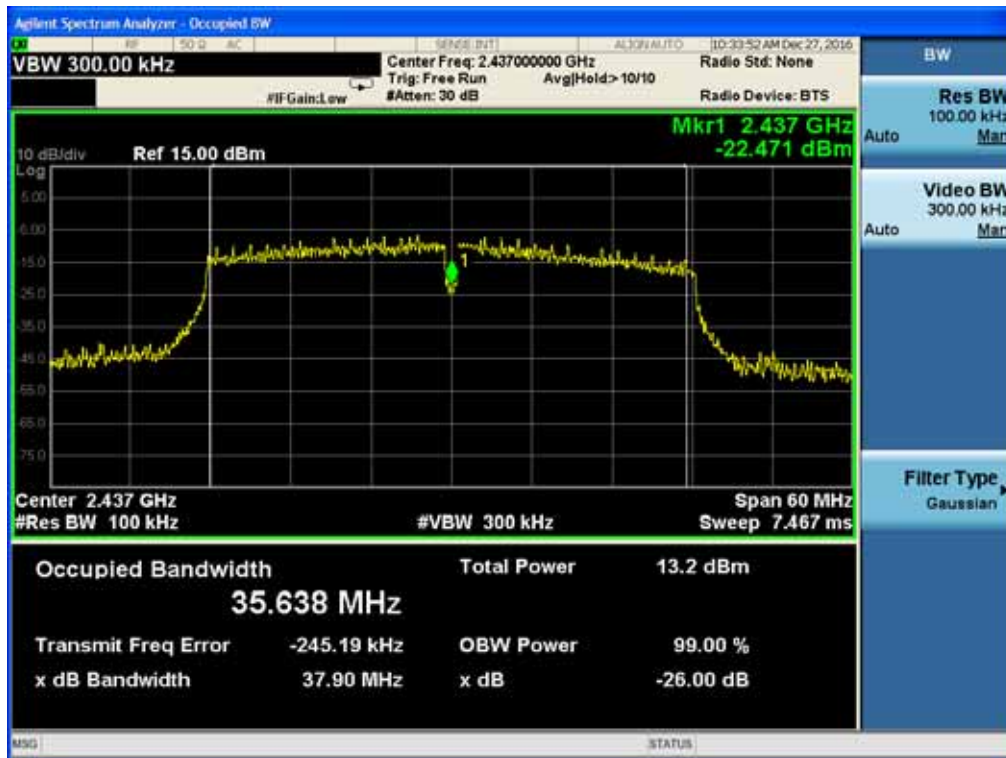


802.11n(HT40)

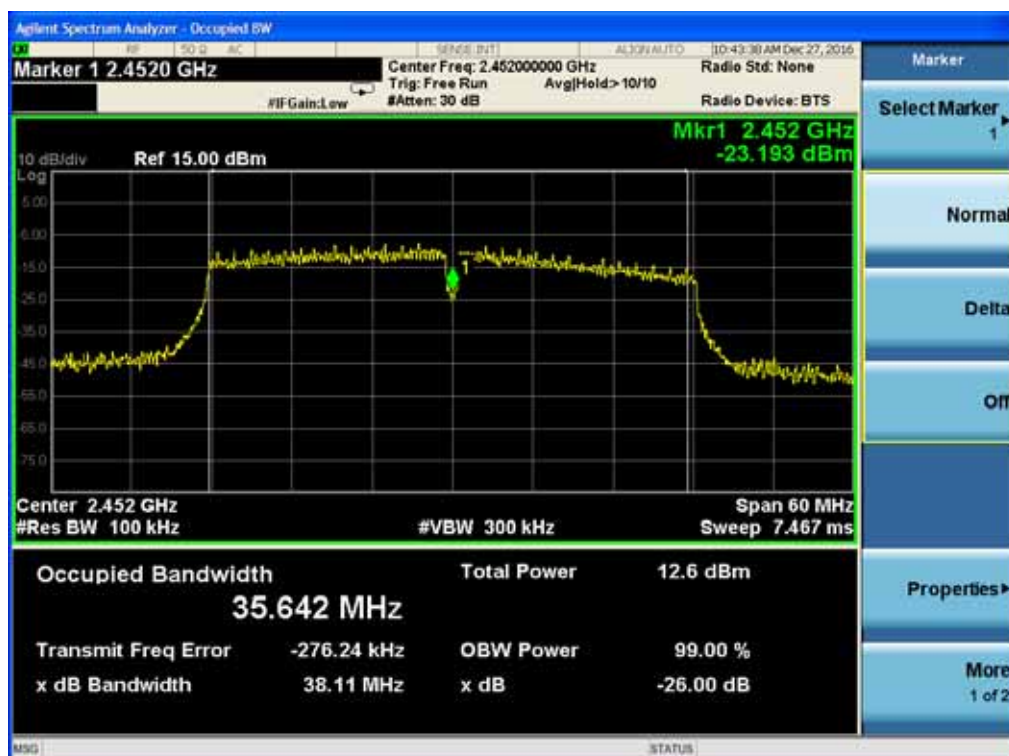
Channel 1:2.422GHz:



Channel 4:2.437GHz



Channel 7:2.452GHz:



5.4 Maximum Peak Output Power

Test Requirement: FCC Part 15 C section 15.247 and RSS-247

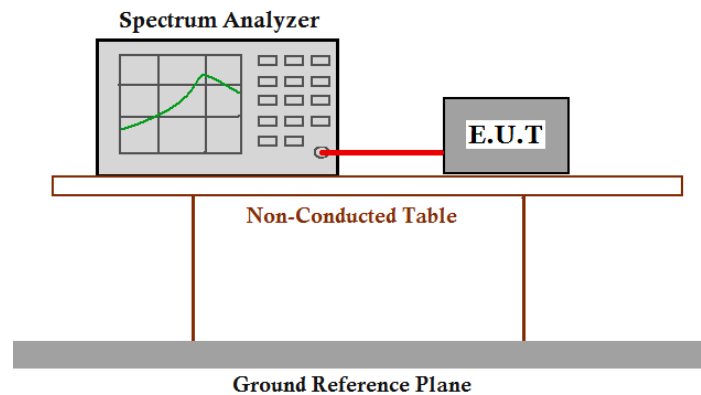
(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Method: ANSI C63.10:2013 Clause 6.10 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01 (Power Output Option 2-Method #1).

Test Status: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (Cable loss = 0.5dB) from the antenna port to the spectrum.
2. Set span to encompass the entire emission bandwidth (EBW) of the signal.
3. Set RBW = 1 MHz.
4. Set VBW $\geq$ 3 MHz.
5. Use sample detector mode if bin width (i.e., span/number of points in spectrum display) $<$ 0.5 RBW. Otherwise use peak detector mode.

6. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep.

If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run".

7. Trace average 100 traces in power averaging mode.

8. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

9. Measure the channel power of the test frequency with special test status.

10. Repeat until all the test status is investigated.

11. Report the worst case.

Test Data:

Test mode	Test Channel	Reading Power (dBm)	Output Power (dBm)	Limit (dBm)	Result
802.11b	2412	15.95	16.45	30	Pass
	2437	13.44	13.94		Pass
	2462	14.95	15.45		Pass
802.11g	2412	13.06	13.56		Pass
	2437	10.87	11.37		Pass
	2462	12.65	13.15		Pass
802.11n(HT20)	2412	13.77	14.27		Pass
	2437	11.20	11.70		Pass
	2462	13.06	13.56		Pass
802.11n(HT40)	2422	14.42	14.92		Pass
	2437	9.95	10.45		Pass
	2452	9.47	9.97		Pass

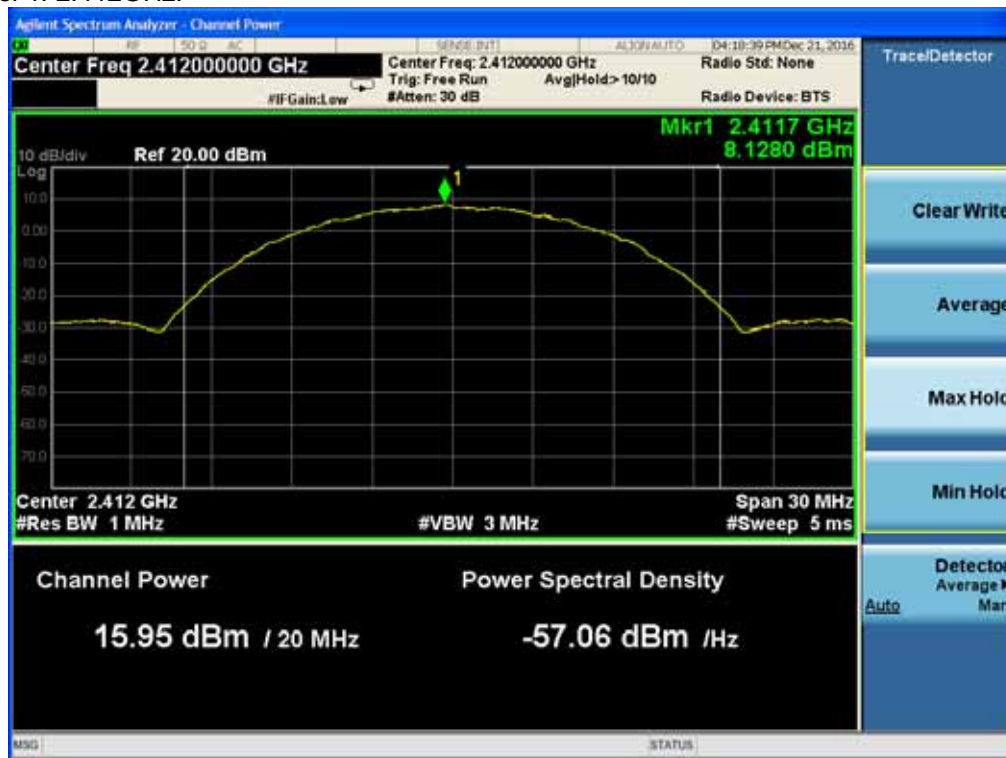
Remark: 1) Output Peak Power=Reading Peak Power+Cable loss
2) Cable loss=0.5dB

The unit does meet the FCC and RSS-247 requirements.

Result plot as follows:

802.11 b

Channel 1: 2.412GHz:



Channel 6: 2.437GHz:



Channel 11: 2.462GHz:



802.11 g

Channel 1: 2.412GHz:



Channel 6: 2.437GHz:



Channel 11: 2.462GHz:



802.11 n (HT20)

Channel 1: 2.412GHz:



Channel 6: 2.437GHz:



Channel 11: 2.462GHz:



802.11 n (HT40)

Channel 1: 2.4122GHz:



Channel 4: 2.437GHz:

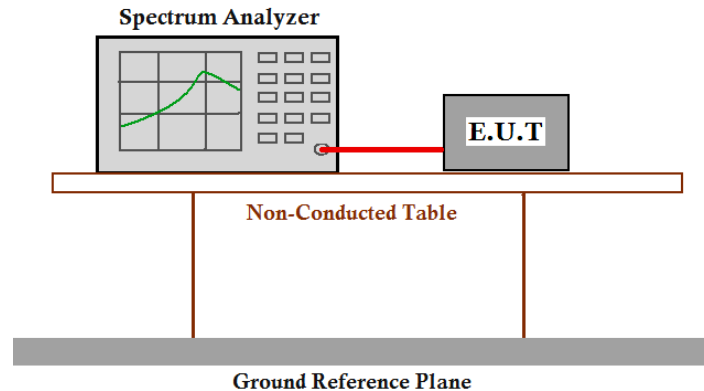


Channel 7: 2.452GHz:



5.5 Peak Power Spectral Density

Test Requirement:	FCC Part 15 C section 15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10:2013 Clause 6.11 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01 (PSD Option 1).
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channel and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable
(Cable loss = 0.5 dB) from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer:
 - a) Set CENTER FREQUENCY = Frequency from Power Spectral Density Test Matrix (see 6.10.2)
 - b) Set SPAN = 1.5 times the DTS bandwidth,
 - c) Set REFERENCE LEVEL = 23 dBm
 - d) Set ATTENUATION = 0 dB (add internal attenuation, if necessary)
 - e) Set SWEEP TIME = Coupled
 - f) Set RBW = 3 kHz
 - g) Set VBW = 10 kHz
 - h) Set DETECTOR = Peak
 - i) Set MKR = Center Frequency
 - j) Set TRACE = CLEAR WRITE

Place the radio in continuous transmit mode. Set the TRACE to MAX HOLD, and after the trace stabilizes, the TRACE to VIEW. Set the marker on the peak of the signal and then adjust the center frequency of the spectrum analyzer to the marker frequency.

After viewing the EUT waveform on the spectrum analyzer, perform the following spectrum analyzer functions to capture the trace:

Set SWEEP TIME = 3 s

Set TRACE = MAX HOLD

Set MKR = PEAK SEARCH

3. Measure the Power Spectral Density of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse case.

Test result:

Test mode	Test Channel	Reading Value (dBm/3kHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11b	2412	0.419	0.919	8	Pass
	2437	0.897	1.397		Pass
	2462	4.328	4.828		Pass
802.11g	2412	-15.553	-15.053		Pass
	2437	-17.296	-16.796		Pass
	2462	-15.997	-15.497		Pass
802.11n(HT20)	2412	-13.900	-13.400		Pass
	2437	-16.659	-16.159		Pass
	2462	-14.390	-13.890		Pass
802.11n(HT40)	2422	-18.781	-18.281		Pass
	2437	-21.829	-21.329		Pass
	2452	-22.528	-22.0528		Pass

Remark: 1) Output Peak Power=Reading Peak Power+Cable loss

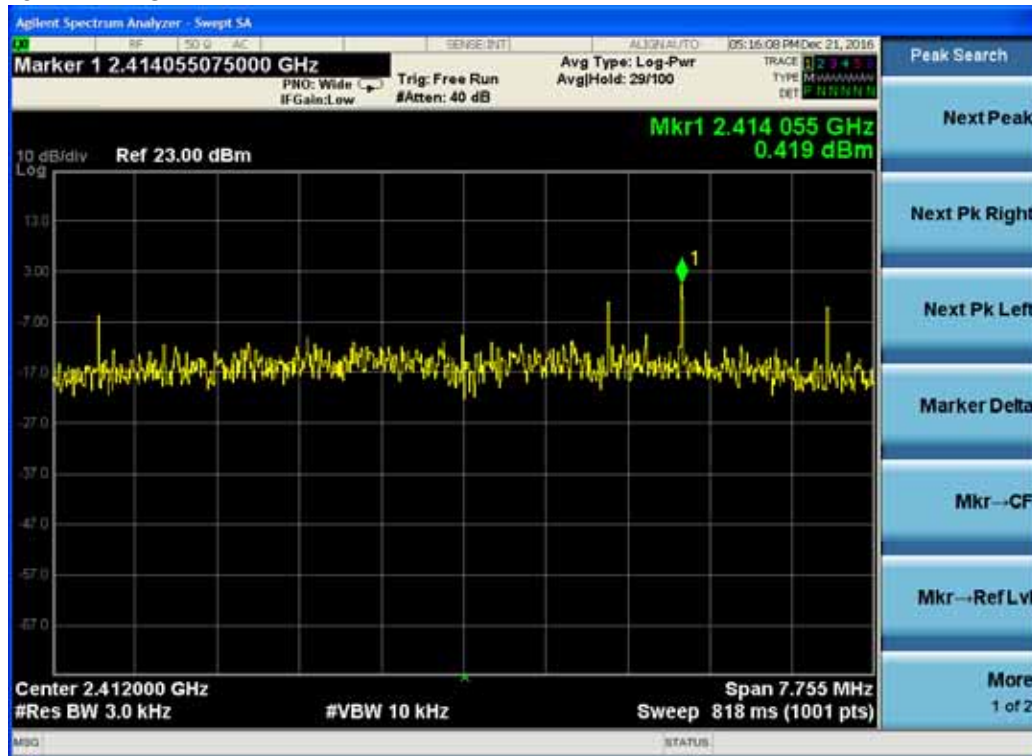
2) Cable loss=0.5dB

The unit does meet the FCC and RSS-247 requirements.

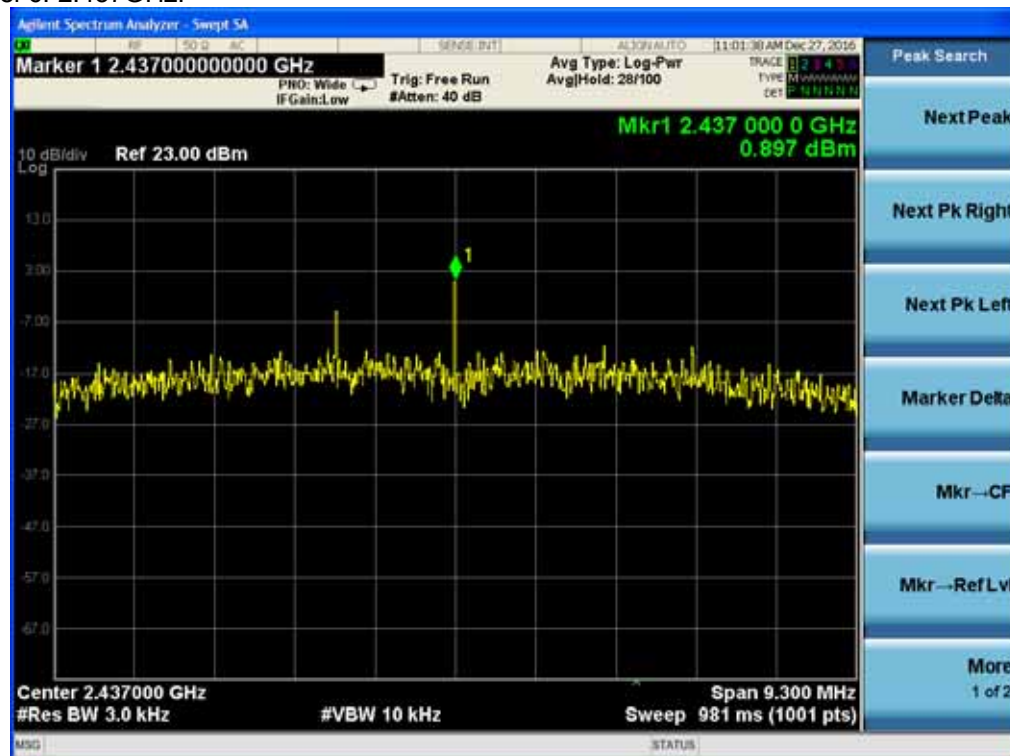
Result plot as follows:

802.11b

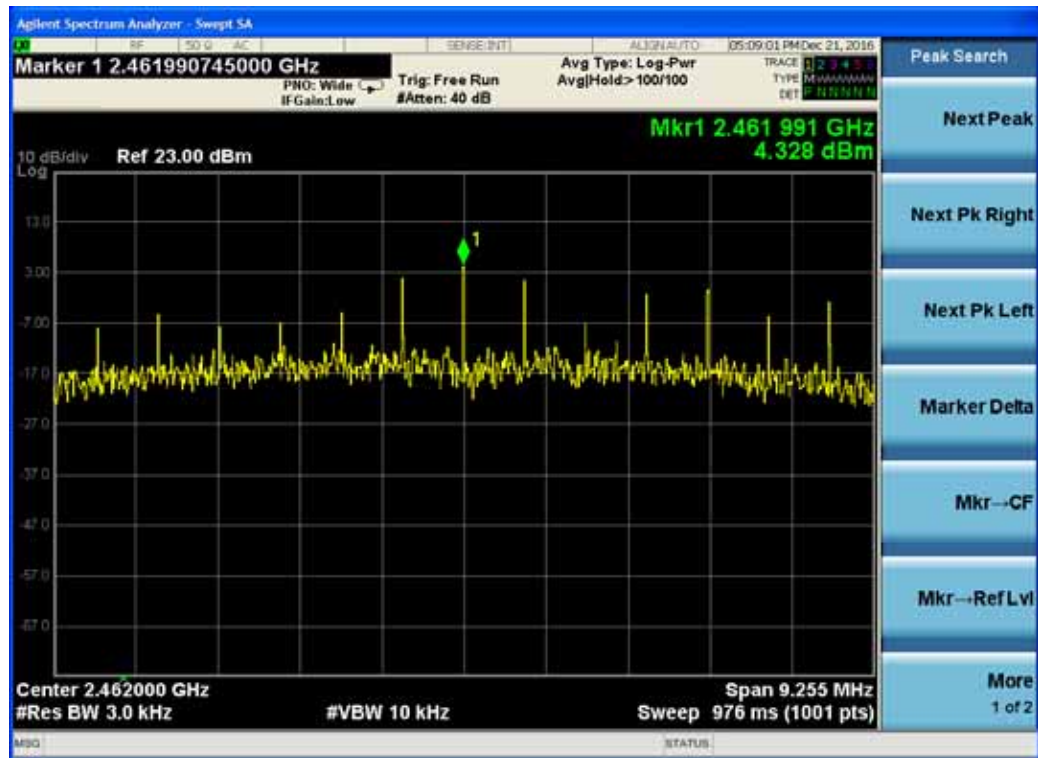
Channel 1: 2.412 GHz:



Channel 6: 2.437GHz:

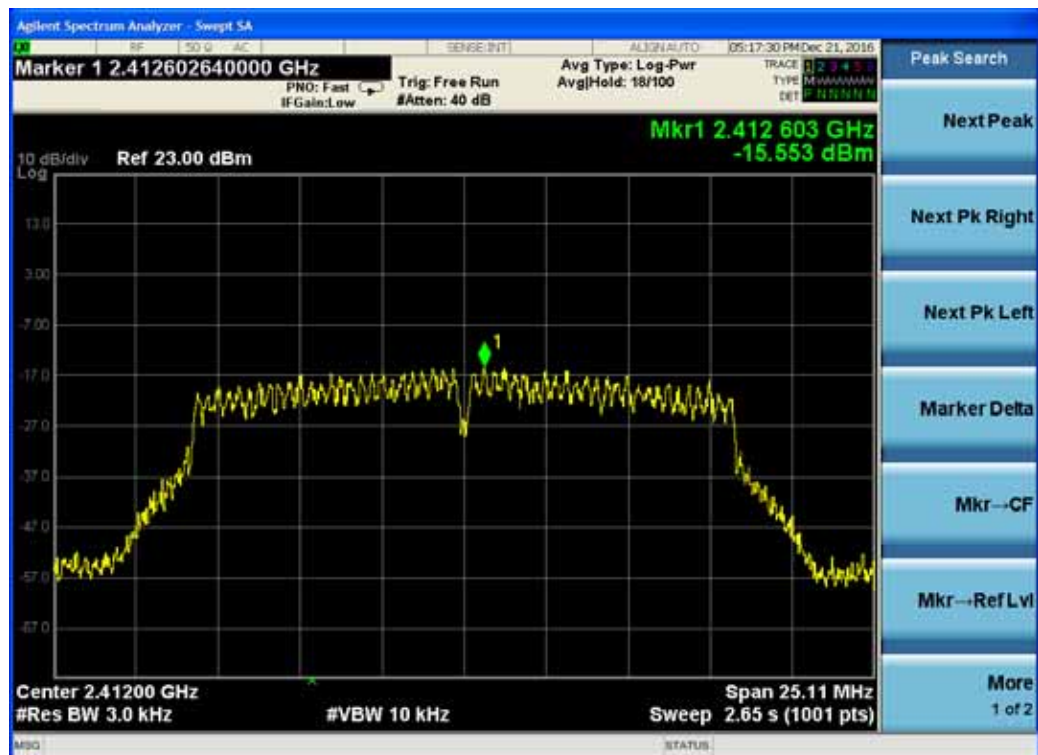


Channel 11:2.462 GHz:

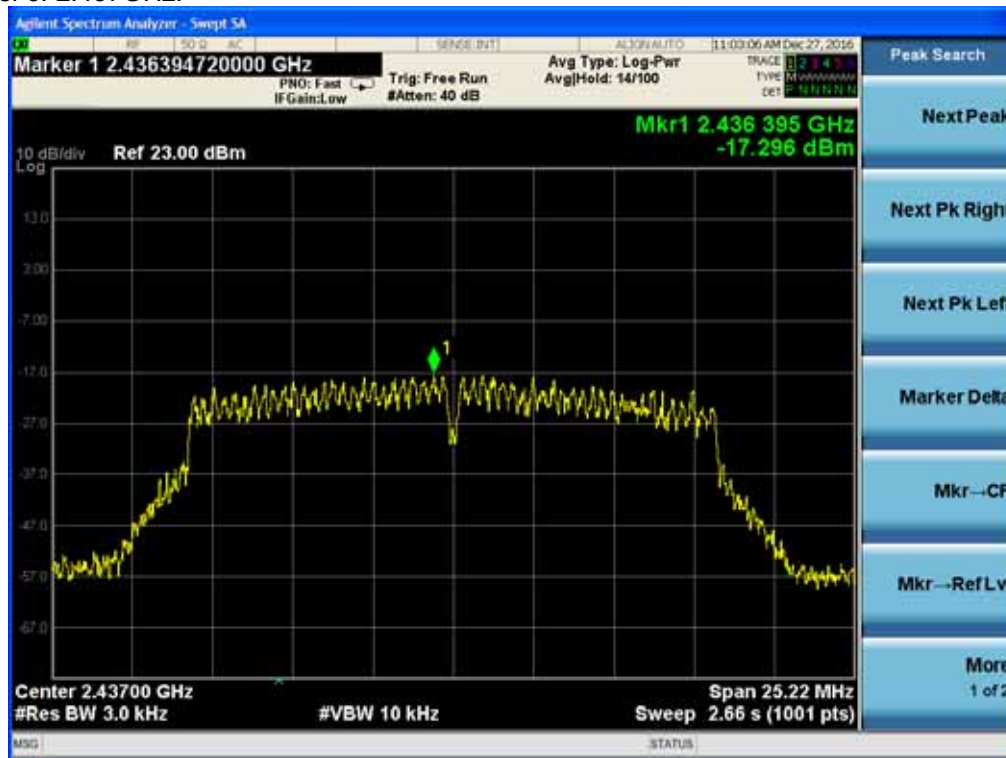


802.11g

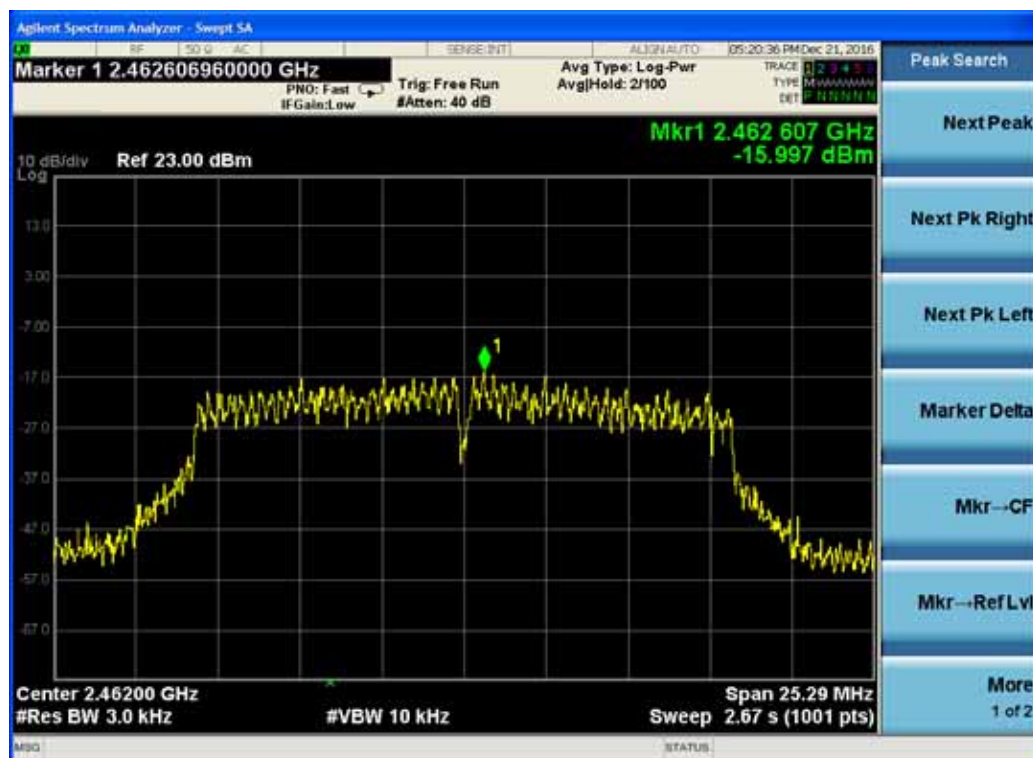
Channel 1:2.412 GHz:



Channel 6: 2.437GHz:

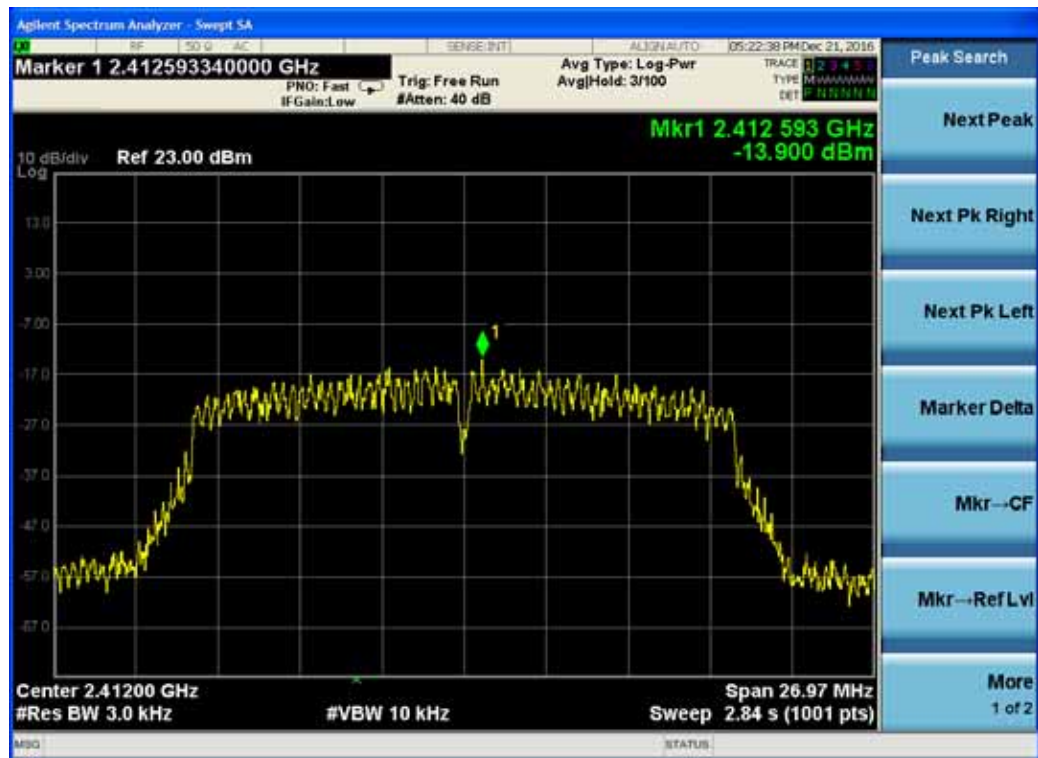


Channel 11: 2.462 GHz:

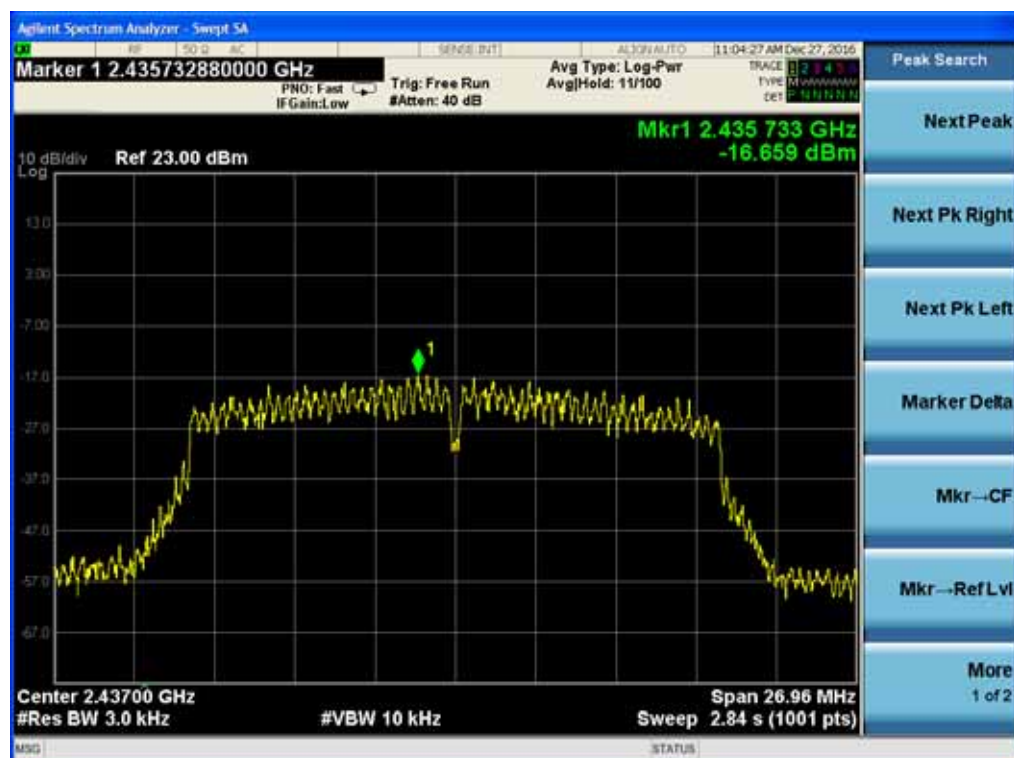


802.11n (HT20)

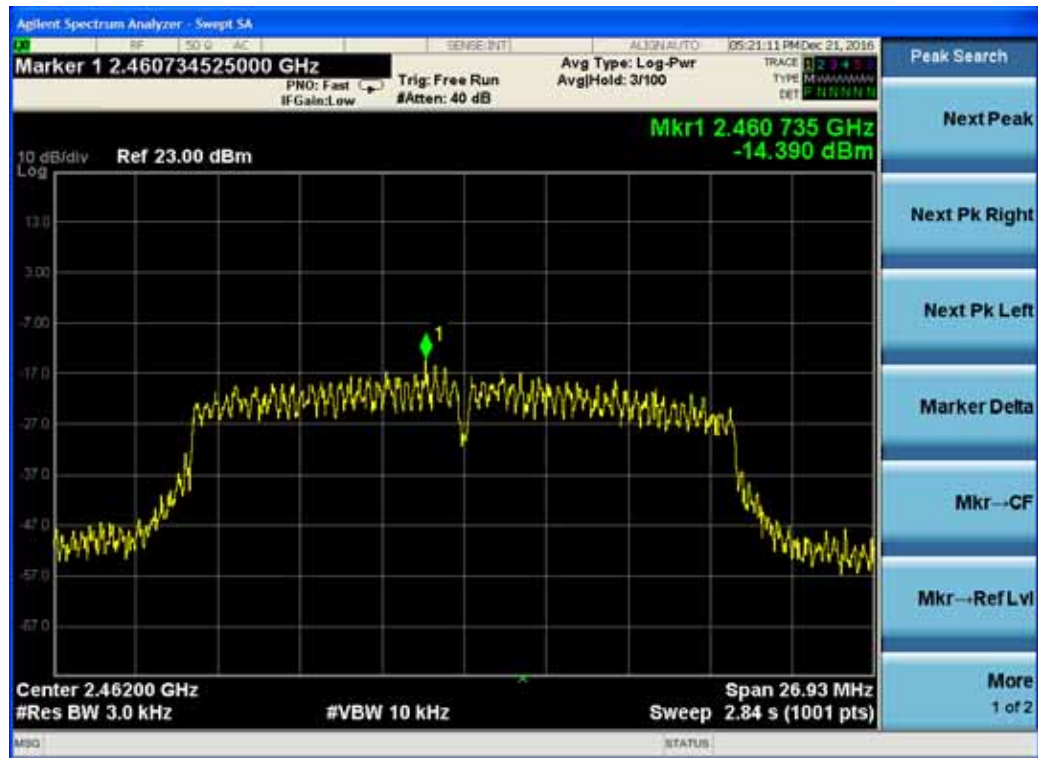
Channel 1: 2.412 GHz:



Channel 6: 2.437GHz:

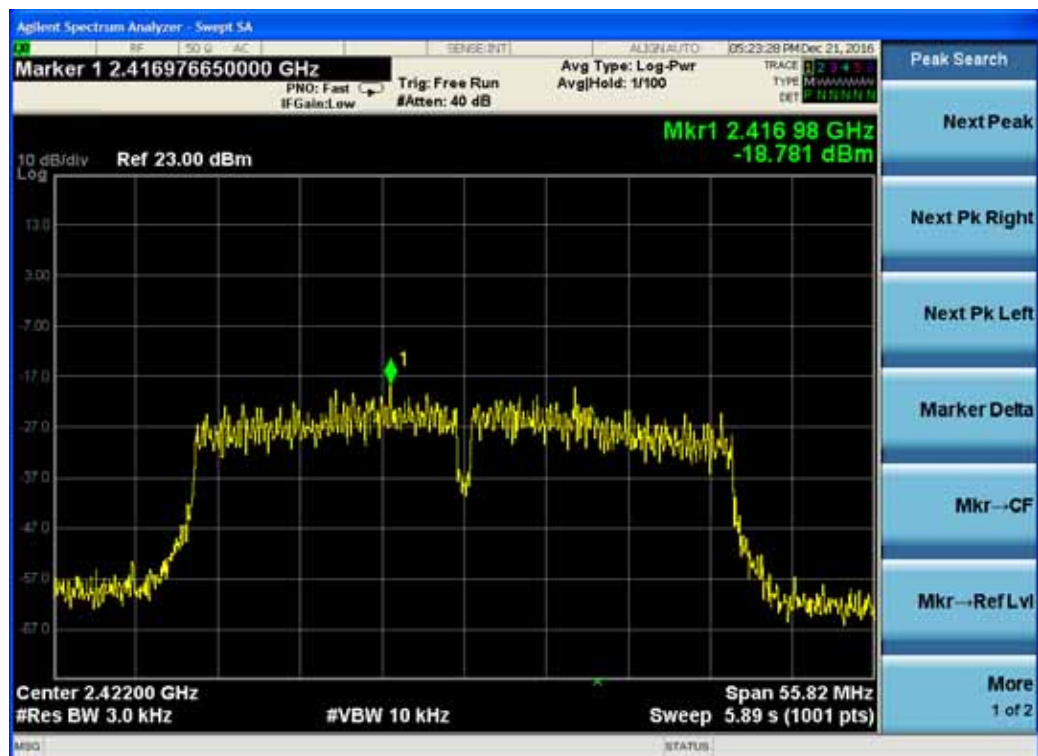


Channel 11:2.462 GHz:

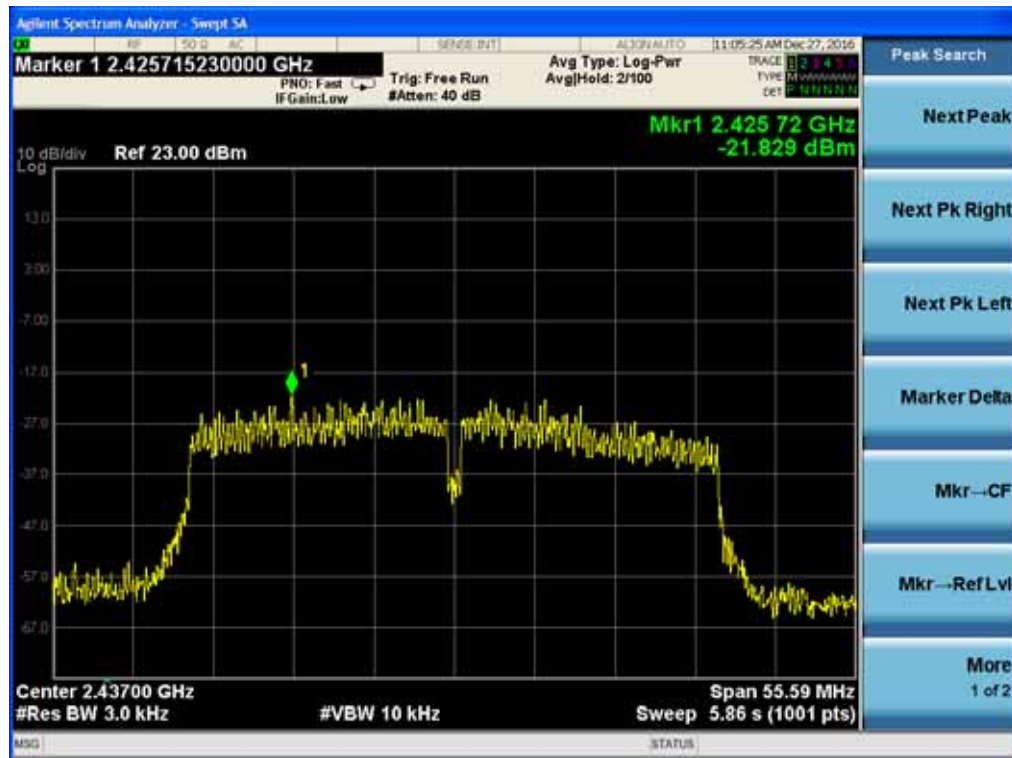


802.11n (HT40)

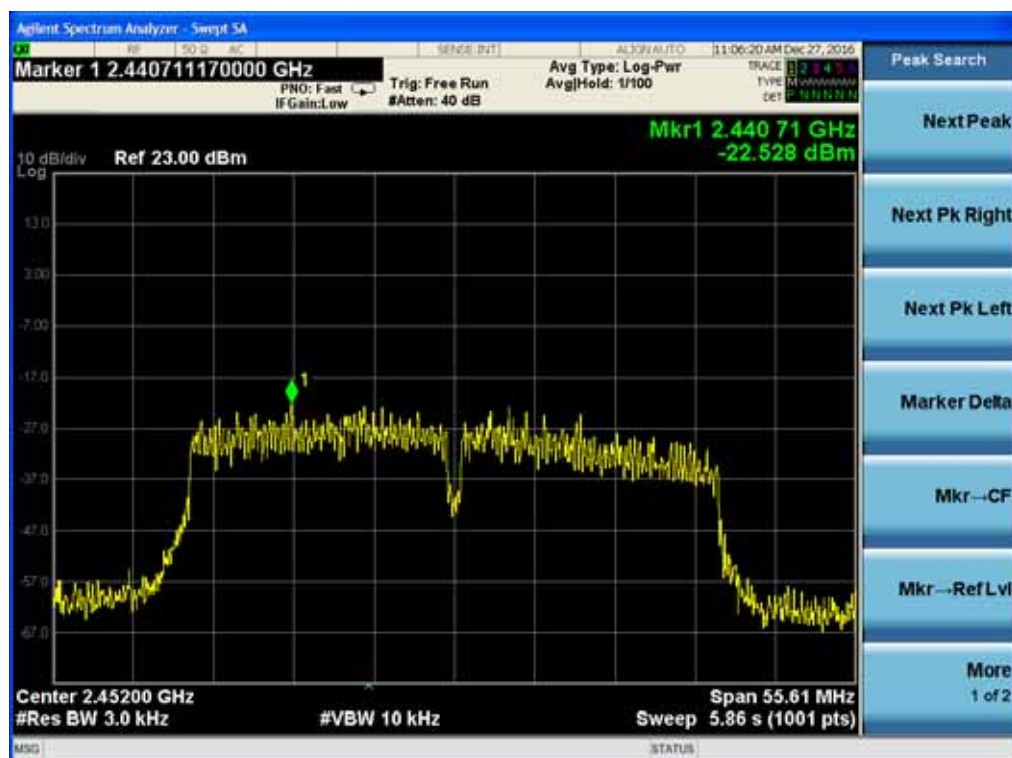
Channel 1:2.422 GHz:



Channel 4:2.437GHz:

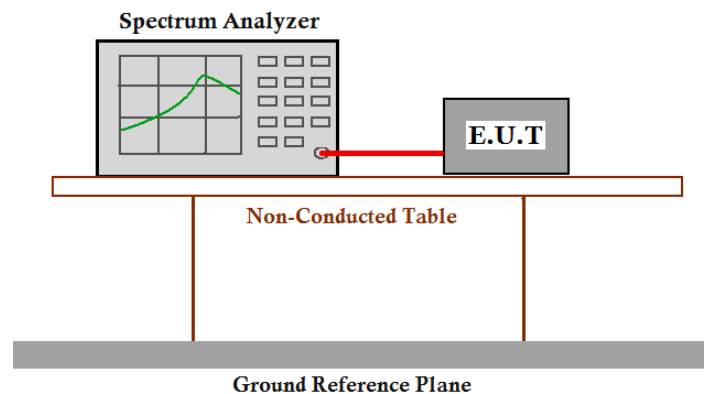


Channel 7:2.452 GHz:



5.6 Conducted Spurious Emissions

Test Requirement:	FCC Part 15 C section 15.247 and RSS-247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.
Test Method:	ANSI C63.10:2013 Clause 6.7 and KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channel and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	



- Test Procedure:
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
 2. Set the spectrum analyzer: RBW=100 KHz, VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Scan up through 10th harmonic.
 3. Measure the Conducted Spurious Emissions of the test frequency with special test status.
 4. Repeat until all the test status is investigated.
 5. Report the worse case.

Result plot as follows:

802.11b

Channel 1: 2.412 GHz



Channel 6: 2.437GHz:



Channel 11: 2.462 GHz

802.11g

Channel 1: 2.412 GHz



Channel 6: 2.437GHz:



Channel 11: 2.462 GHz



802.11n(HT20)

Channel 1: 2.412 GHz



Channel 6: 2.437GHz:



Channel 11: 2.462 GHz



802.11n(HT40)

Channel 1: 2.422 GHz



Channel 4: 2.437GHz:



Channel 7: 2.452 GHz



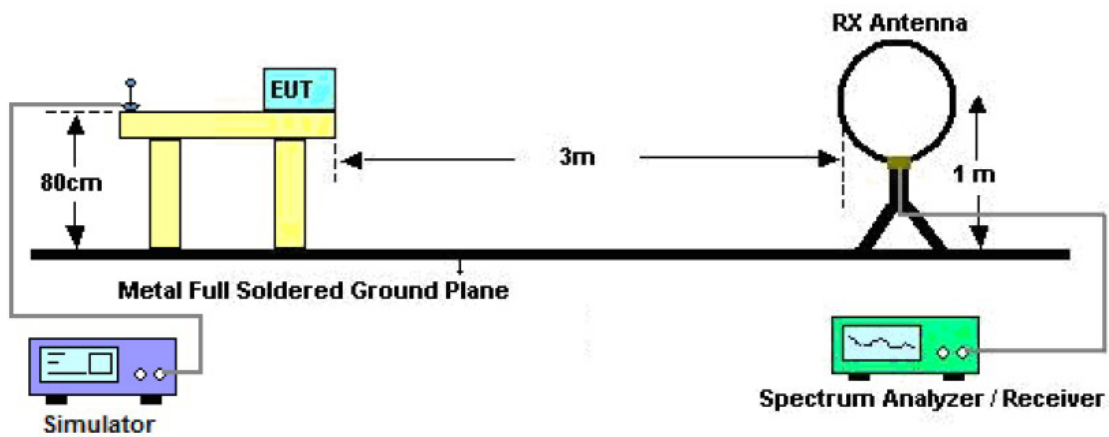
The unit does meet the FCC and RSS-247 requirements.

5.7 Radiated Spurious Emissions

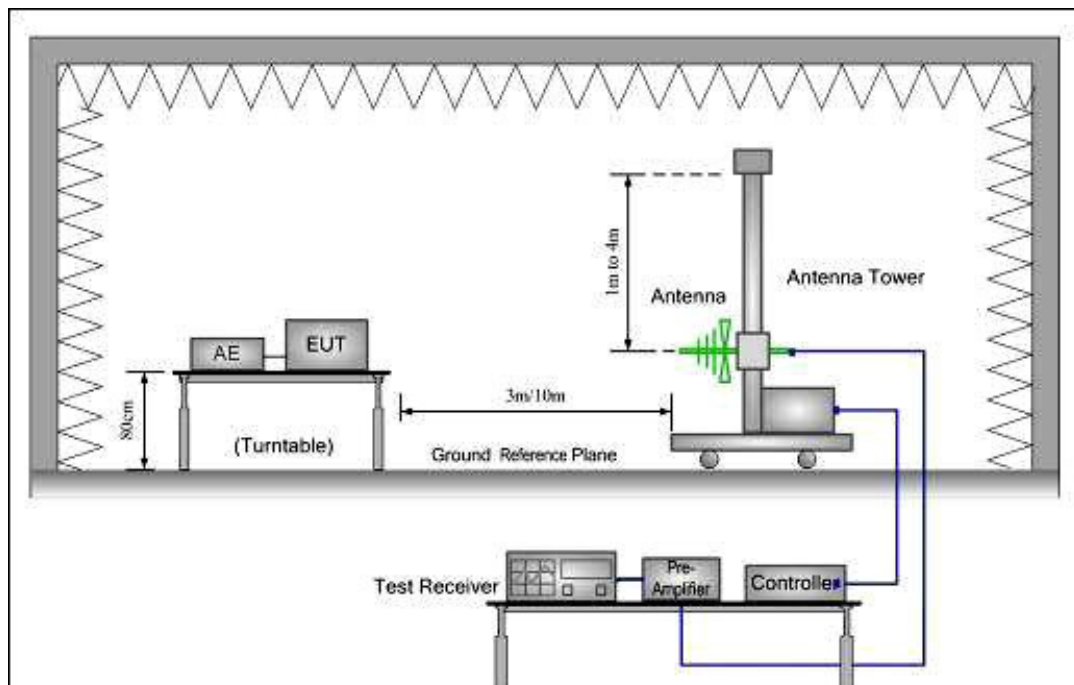
Test Requirement:	FCC Part 15 C section 15.247 and RSS-247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and provided the transmitter demonstrates compliance with the peak conducted power limits.
Test Method:	ANSI C63.10:2013 Clause 6.4, 6.5 and 6.6 & KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Detector: For PK value:	RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW $\geq$ RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9kHz for < 30 MHz VBW = 10 Hz Sweep = auto Detector function = peak Trace = max hold
15.209 Limit:	40.0 dB μ V/m between 30 MHz & 88 MHz 43.5 dB μ V/m between 88 MHz & 216 MHz 46.0 dB μ V/m between 216 MHz & 960 MHz 54.0 dB μ V/m above 960 MHz

Test Configuration:

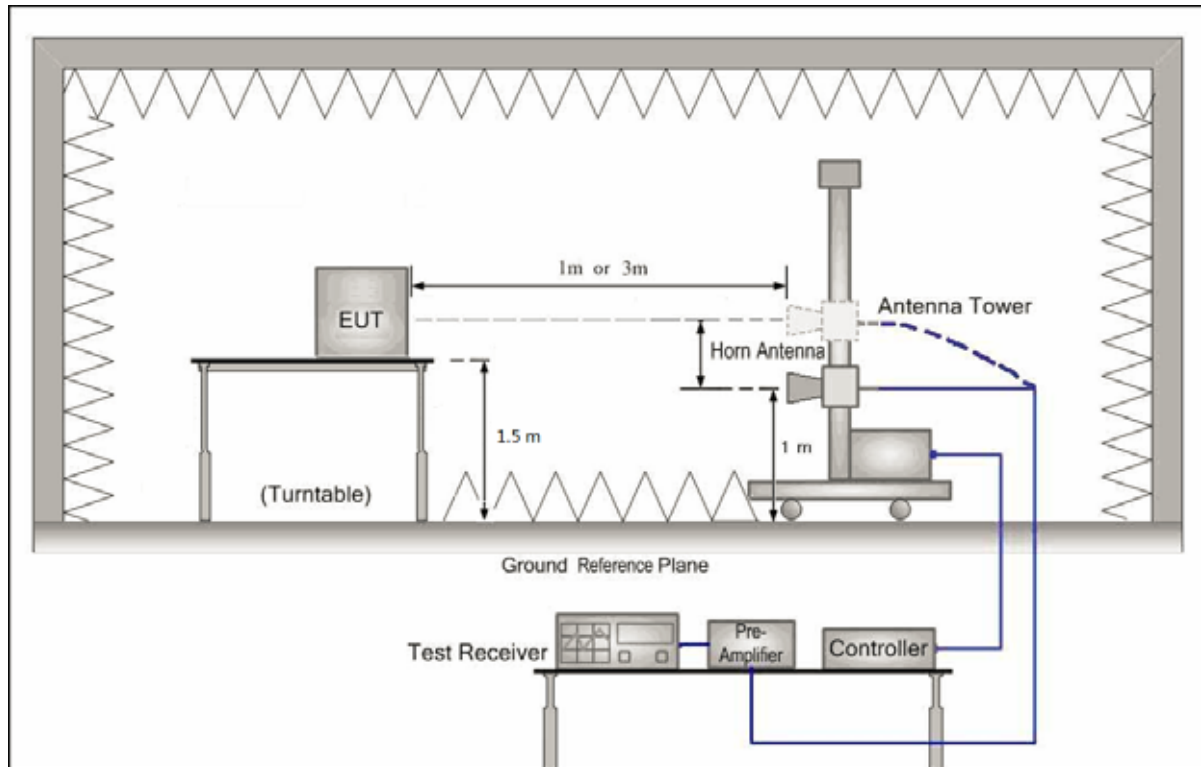
- 1) 9kHz to 30MHz emissions:



- 2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 40 GHz emissions:



- Test Procedure:** (1) The receiver was scanned from 0.009MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only. The worst case emissions were reported.
- (2) Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.
- (3) Pre-test under all modes below 1GHz, choose the worst case mode (802.11b) record On the report.

5.7.1 Harmonic and other spurious emissions

Test at Channel 1 (2.412 GHz) in transmitting status

9kHz~30MHz Test result

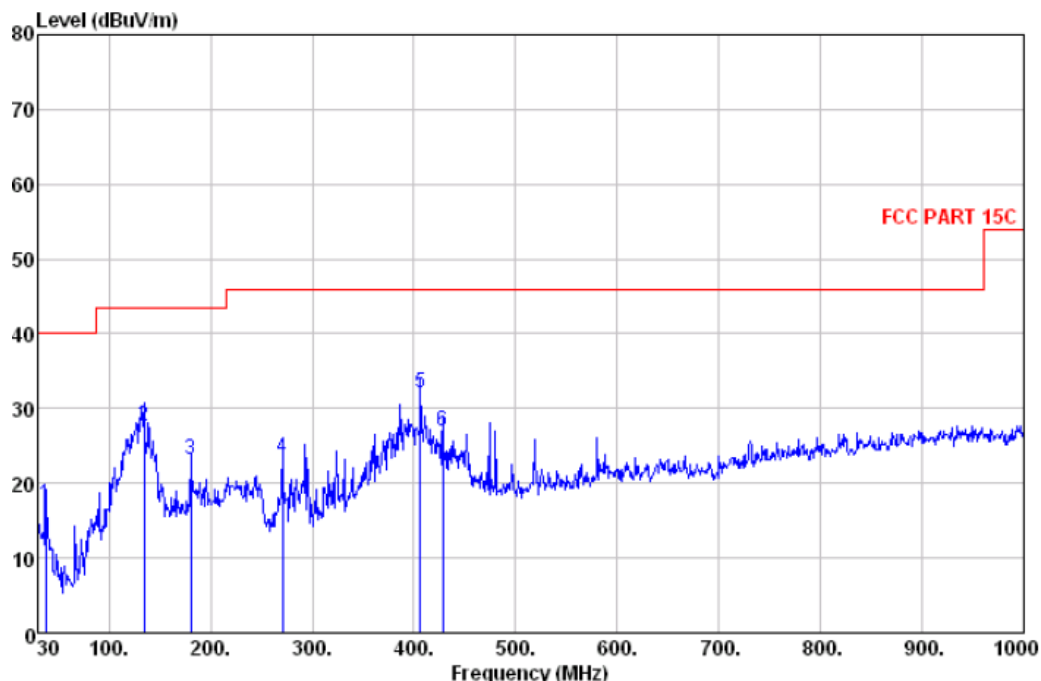
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

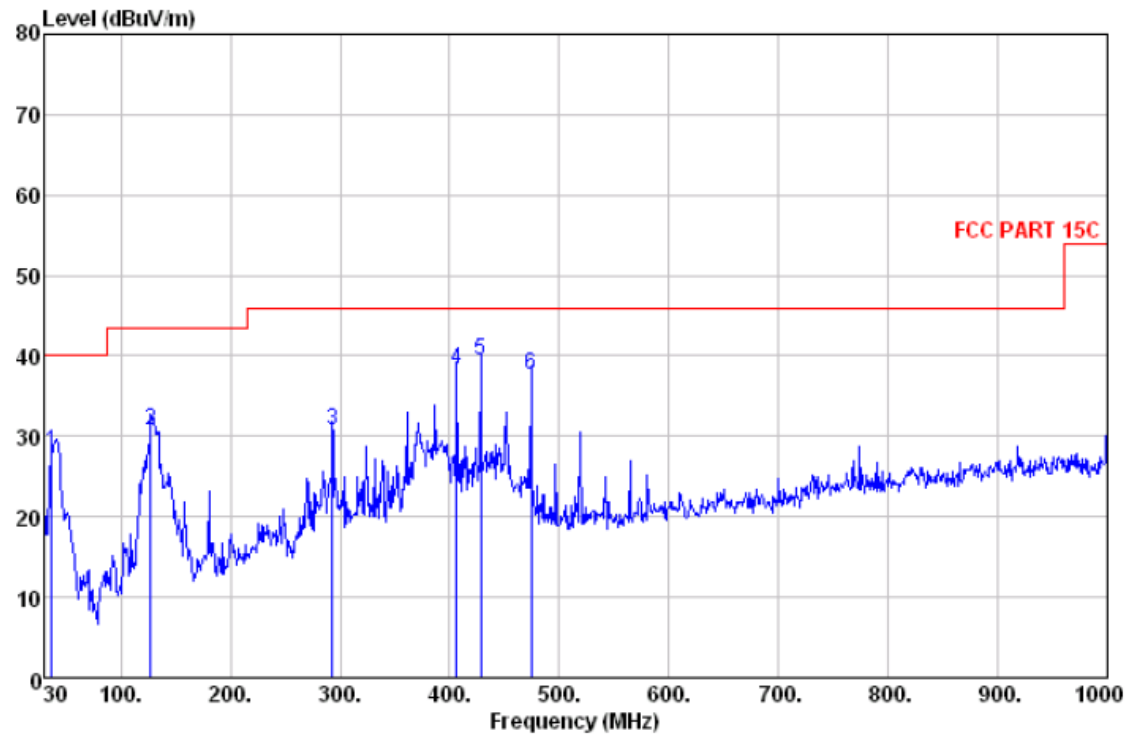
No.	Freq MHz	Read Level dBμV	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dBμV/m	Limit Line dBμV/m	Over Limit dB	Pol/Phase	Remark
1	37.760	31.16	13.57	0.70	28.32	17.11	40.00	-22.89	HORIZONTAL	QP
2	134.760	47.18	7.40	1.38	28.30	27.66	43.50	-15.84	HORIZONTAL	QP
3	180.350	41.10	8.21	1.61	27.79	23.13	43.50	-20.37	HORIZONTAL	QP
4	270.560	35.89	12.77	2.01	27.23	23.44	46.00	-22.56	HORIZONTAL	QP
5	406.360	41.99	15.86	2.47	28.17	32.15	46.00	-13.85	HORIZONTAL	QP
6	428.670	36.11	16.41	2.56	28.18	26.90	46.00	-19.10	HORIZONTAL	QP

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

No.	Freq MHz	Read Level dB μ V	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dB μ V/m	Limit Line dB μ V/m	Over Limit dB	Pol/Phase	Remark
1	36.790	41.53	14.25	0.69	28.41	28.06	40.00	-11.94	VERTICAL	QP
2	127.000	50.45	7.48	1.34	28.43	30.84	43.50	-12.66	VERTICAL	QP
3	292.870	42.85	13.41	2.09	27.53	30.82	46.00	-15.18	VERTICAL	QP
4	406.360	48.15	15.86	2.47	28.17	38.31	46.00	-7.69	VERTICAL	QP
5	428.670	48.64	16.41	2.56	28.18	39.43	46.00	-6.57	VERTICAL	QP
6	474.260	45.49	17.89	2.70	28.41	37.67	46.00	-8.33	VERTICAL	QP

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
4824.000	34.32	9.59	27.62	36.35	52.64	74.00	V
7236.000	34.88	12.15	27.33	35.32	55.02	74.00	V
9648.000	37.72	14.41	27.14	35.95	60.94	74.00	V
4824.000	34.32	9.59	27.62	36.03	52.32	74.00	H
7236.000	34.88	12.15	27.33	35.77	55.47	74.00	H
9648.000	37.72	14.41	27.14	37.21	62.20	74.00	H

Average Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
4824.000	34.32	9.59	27.62	25.58	41.87	54.00	V
7236.000	34.88	12.15	27.33	25.09	44.79	54.00	V
9648.000	37.72	14.41	27.14	24.43	49.42	54.00	V
4824.000	34.32	9.59	27.62	24.31	40.60	54.00	H
7236.000	34.88	12.15	27.33	25.53	45.23	54.00	H
9648.000	37.72	14.41	27.14	24.42	49.41	54.00	H

Test at Channel 6 (2.437 GHz) in transmitting status

9 kHz~30MHz Test result

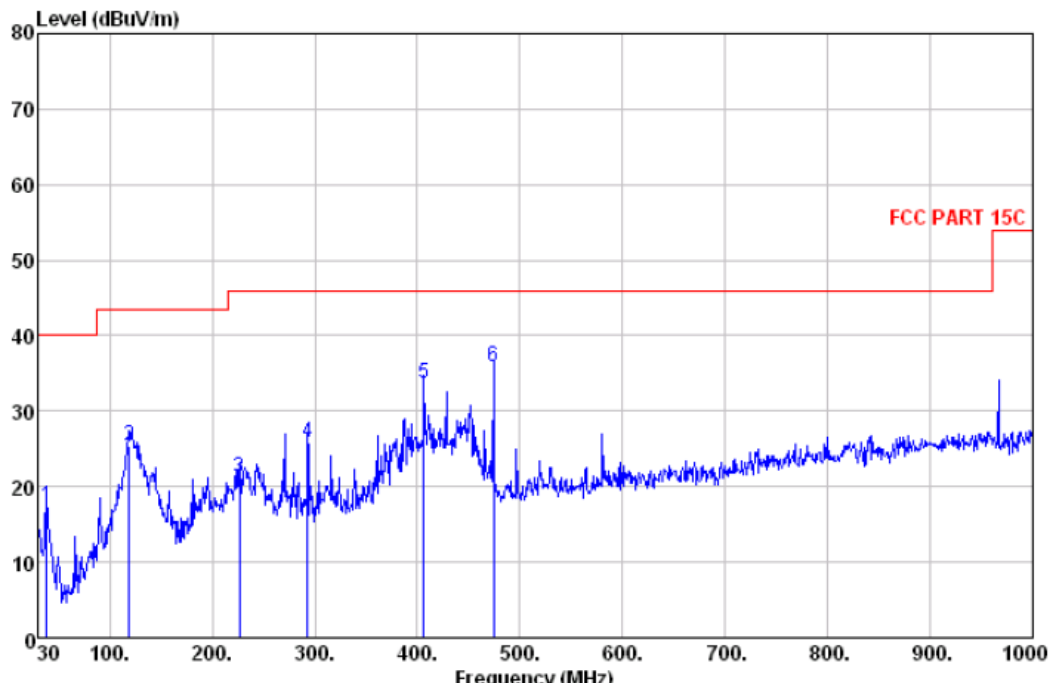
The Low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

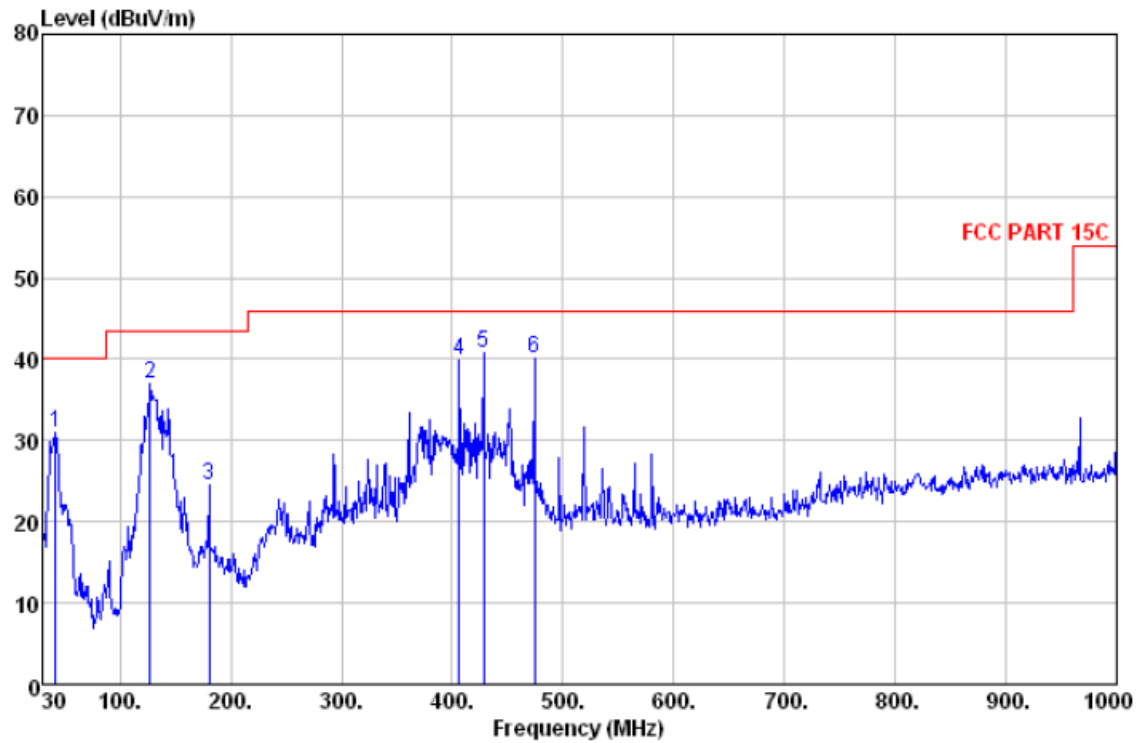
No.	Freq MHz	Read Level dBμV	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dBμV/m	Limit Line dBμV/m	Over Limit dB	Pol/Phase	Remark
1	38.730	32.02	12.96	0.71	28.22	17.47	40.00	-22.53	HORIZONTAL	QP
2	119.240	44.93	7.76	1.29	28.51	25.47	43.50	-18.03	HORIZONTAL	QP
3	226.910	36.28	10.71	1.83	27.59	21.23	46.00	-24.77	HORIZONTAL	QP
4	292.870	37.92	13.41	2.09	27.53	25.89	46.00	-20.11	HORIZONTAL	QP
5	406.360	43.58	15.86	2.47	28.17	33.74	46.00	-12.26	HORIZONTAL	QP
6	474.260	43.65	17.89	2.70	28.41	35.83	46.00	-10.17	HORIZONTAL	QP

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

No.	Freq MHz	Read Level dB μ V	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dB μ V/m	Limit Line dB μ V/m	Over Limit dB	Pol/Phase	Remark
1	41.640	46.81	11.71	0.73	28.24	31.01	40.00	-8.99	VERTICAL	Peak
2	127.000	56.52	7.48	1.34	28.43	36.91	43.50	-6.59	VERTICAL	Peak
3	180.350	42.42	8.21	1.61	27.79	24.45	43.50	-19.05	VERTICAL	Peak
4	406.360	49.79	15.86	2.47	28.17	39.95	46.00	-6.05	VERTICAL	Peak
5	428.670	50.04	16.41	2.56	28.18	40.83	46.00	-5.17	VERTICAL	Peak
6	474.260	47.82	17.89	2.70	28.41	40.00	46.00	-6.00	VERTICAL	Peak

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB μ V)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
4884.000	34.37	9.66	27.61	36.07	52.49	74.00	V
7326.000	35.07	12.23	27.33	35.97	55.94	74.00	V
9768.000	37.91	14.49	27.13	35.99	61.26	74.00	V
4884.000	34.37	9.66	27.61	34.89	51.31	74.00	H
7326.000	35.07	12.23	27.33	35.57	55.54	74.00	H
9768.000	37.91	14.49	27.13	33.97	59.24	74.00	H

Average Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB μ V)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
4884.000	34.37	9.66	27.61	24.75	41.17	54.00	V
7326.000	35.07	12.23	27.33	24.52	44.49	54.00	V
9768.000	37.91	14.49	27.13	23.89	49.16	54.00	V
4884.000	34.37	9.66	27.61	25.09	41.51	54.00	H
7326.000	35.07	12.23	27.33	24.64	44.61	54.00	H
9768.000	37.91	14.49	27.13	24.23	49.50	54.00	H

Test at Channel 11 (2.462 GHz) in transmitting status

9kHz~30MHz Test result

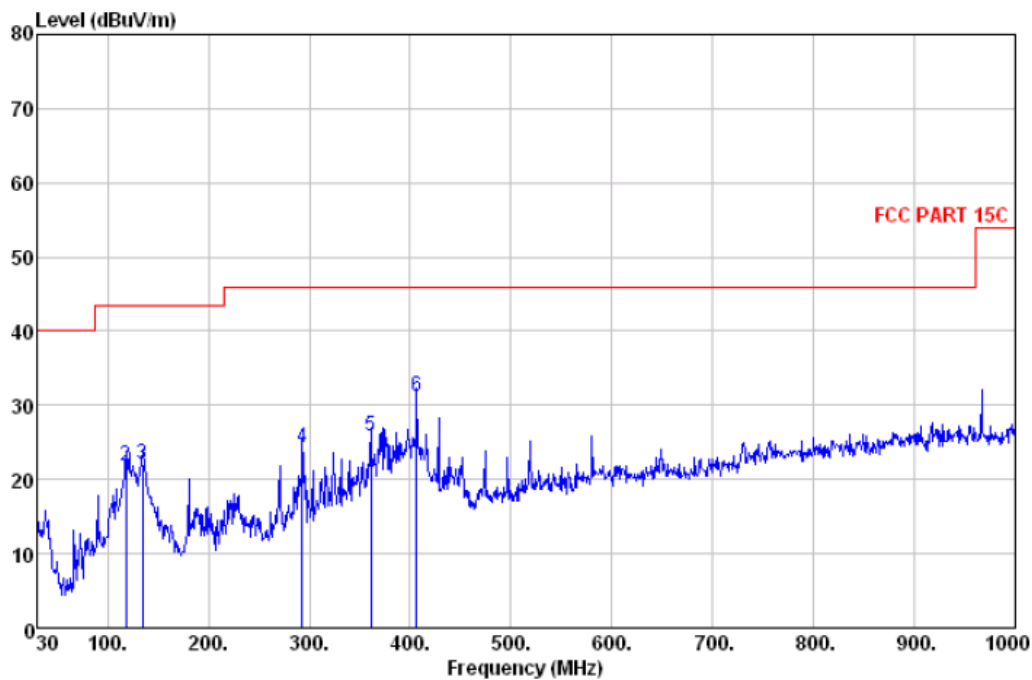
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

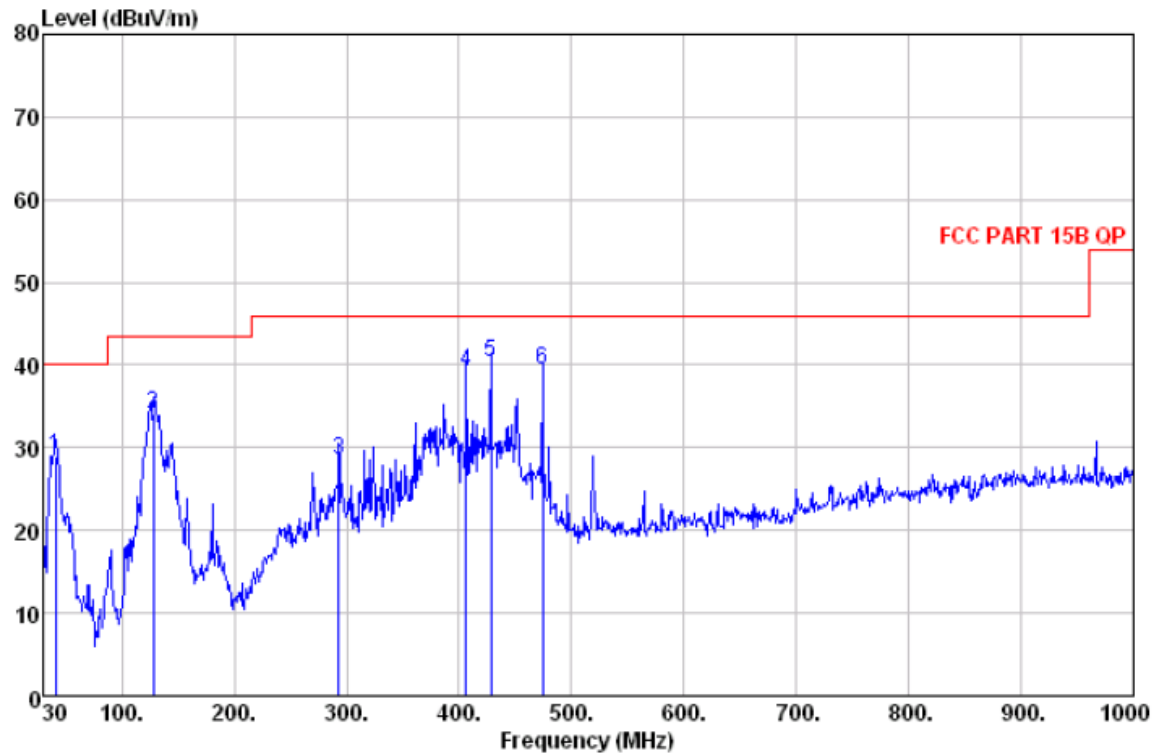
No.	Freq MHz	Read Level dBμV	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dBμV/m	Limit Line dBμV/m	Over Limit dB	Pol/Phase	Remark
1	30.000	25.03	17.70	0.63	28.50	14.86	40.00	-25.14	HORIZONTAL	QP
2	118.270	41.26	7.84	1.29	28.52	21.87	43.50	-21.63	HORIZONTAL	QP
3	134.760	41.51	7.40	1.38	28.30	21.99	43.50	-21.51	HORIZONTAL	QP
4	292.870	36.33	13.41	2.09	27.53	24.30	46.00	-21.70	HORIZONTAL	QP
5	360.770	37.17	14.26	2.31	27.78	25.96	46.00	-20.04	HORIZONTAL	QP
6	406.360	41.06	15.86	2.47	28.17	31.22	46.00	-14.78	HORIZONTAL	QP

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

No.	Freq MHz	Read Level dBμV	Antenna Factor dB	Cable Loss dB	Preamp Factor dB	Level dBμV/m	Limit Line dBμV/m	Over Limit dB	Pol/Phase	Remark
1	40.670	44.34	12.00	0.72	28.16	28.90	40.00	-11.10	VERTICAL	QP
2	127.970	53.78	7.42	1.35	28.42	34.13	43.50	-9.37	VERTICAL	QP
3	292.870	40.60	13.41	2.09	27.53	28.57	46.00	-17.43	VERTICAL	QP
4	406.360	49.09	15.86	2.47	28.17	39.25	46.00	-6.75	VERTICAL	QP
5	428.670	49.65	16.41	2.56	28.18	40.44	46.00	-5.56	VERTICAL	QP
6	474.260	47.17	17.89	2.70	28.41	39.35	46.00	-6.65	VERTICAL	QP

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
4924.000	34.35	9.62	27.61	35.14	51.50	74.00	V
7286.000	35.01	12.21	27.32	34.26	54.16	74.00	V
9848.000	37.93	14.50	27.12	34.86	60.17	74.00	V
4924.000	34.35	9.62	27.61	36.33	52.69	74.00	H
7286.000	35.01	12.21	27.32	35.92	55.82	74.00	H
9848.000	37.93	14.50	27.12	37.36	62.67	74.00	H

Average Measurement:

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
4924.000	34.35	9.62	27.61	22.89	39.25	54.00	V
7286.000	35.01	12.21	27.32	24.01	43.91	54.00	V
9848.000	37.93	14.50	27.12	22.98	48.29	54.00	V
4924.000	34.35	9.62	27.61	23.16	39.52	54.00	H
7286.000	35.01	12.21	27.32	23.36	43.26	54.00	H
9848.000	37.93	14.50	27.12	24.09	49.40	54.00	H

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor.

No any other emissions level which are attenuated less than 20dB below the limit.

According to 15.31(o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Hence there no other emissions have been reported.

Remark:

- 1) .For this intentional radiator operates below 25 GHz. The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency. And above the third harmonic of this intentional radiator, the disturbance is very low. So the test result only displays to 3rd harmonic.
- 2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.
- 3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the FCC and RSS-247 requirements.

5.8 Radiated Emissions which fall in the restricted bands

Test Requirement:	FCC Part 15 C section 15.247 and RSS-247 (d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10:2013 Clause 6.4, 6.5 and 6.6 & KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz.
Detector:	For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW $\geq$ RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW = 10Hz Sweep = auto Detector function = peak Trace = max hold

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section. Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

Test Result:

Pre-test under all modes, choose the worst case mode (802.11b) record On the report.

Test at Channel 1 (2.412 GHz) in transmitting status

Antenna polarization: Vertical

Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	33.76	23.65	39.08	28.97
2390.000	26.56	6.46	27.79	32.07	24.08	37.30	29.31
2500.000	25.70	6.62	27.80	34.11	23.73	38.63	28.25
2483.500	25.79	6.61	27.80	34.64	23.24	39.24	27.84

Antenna polarization: Horizontal

Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	33.75	22.08	39.07	27.40
2390.000	26.56	6.46	27.79	33.07	24.42	38.30	29.65
2500.000	25.70	6.62	27.80	34.21	22.64	38.73	27.16
2483.500	25.79	6.61	27.80	34.89	23.32	39.49	27.92

Test at Channel 6 (2.437 GHz) in transmitting status

Antenna polarization: Vertical

Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	34.99	23.97	40.31	29.29
2390.000	26.56	6.46	27.79	35.02	24.61	40.25	29.84
2500.000	25.70	6.62	27.80	34.07	23.88	38.59	28.40
2483.500	25.79	6.61	27.80	35.22	23.04	39.82	27.64

Antenna polarization: Horizontal

Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	34.98	23.08	40.30	28.40
2390.000	26.56	6.46	27.79	34.46	22.53	39.69	27.76
2500.000	25.70	6.62	27.80	33.13	23.46	37.65	27.98
2483.500	25.79	6.61	27.80	34.22	22.24	38.82	26.84

Test at Channel 11 (2.462 GHz) in transmitting status

Antenna polarization: Vertical

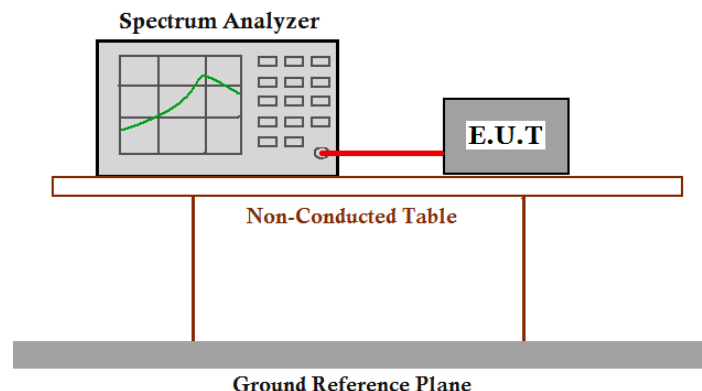
Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	33.98	22.14	39.30	27.46
2390.000	26.56	6.46	27.79	33.21	23.09	38.44	28.32
2500.000	25.70	6.62	27.80	34.02	22.75	38.54	27.27
2483.500	25.79	6.61	27.80	34.23	22.56	38.83	27.16

Antenna polarization: Horizontal

Frequency (MHz)	Antenna factors (dB/m)	Cable loss(dB)	Preamp factor(dB)	Peak Reading Level (dBμV)	Average Reading Level (dBμV)	Peak Emission Level (dBμV/m)	Average Emission Level (dBμV/m)
2310.000	26.65	6.45	27.78	34.98	23.24	40.30	28.56
2390.000	26.56	6.46	27.79	34.21	23.63	39.44	28.86
2500.000	25.70	6.62	27.80	33.25	22.73	37.77	27.25
2483.500	25.79	6.61	27.80	33.24	24.13	37.84	28.73

5.9 Band Edges Requirement

Test Requirement:	FCC Part 15 C section 15.247 and RSS-247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.
Frequency Band:	2400 MHz to 2483.5 MHz
Test Method:	ANSI C63.10:2013 Clause 6.9 & KDB 558074 D01 v03r05, KDB 662911 D01 Multiple Transmitter Output v02r01
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set RBW=100 kHz, VBW=300 KHz, suitable frequency span including 1000 kHz bandwidth from band edge.
3. Measure the Conducted Spurious Emissions and Radiated Emissions of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse.

Test result with plots as follows:

The band edges was measured and recorded Result:

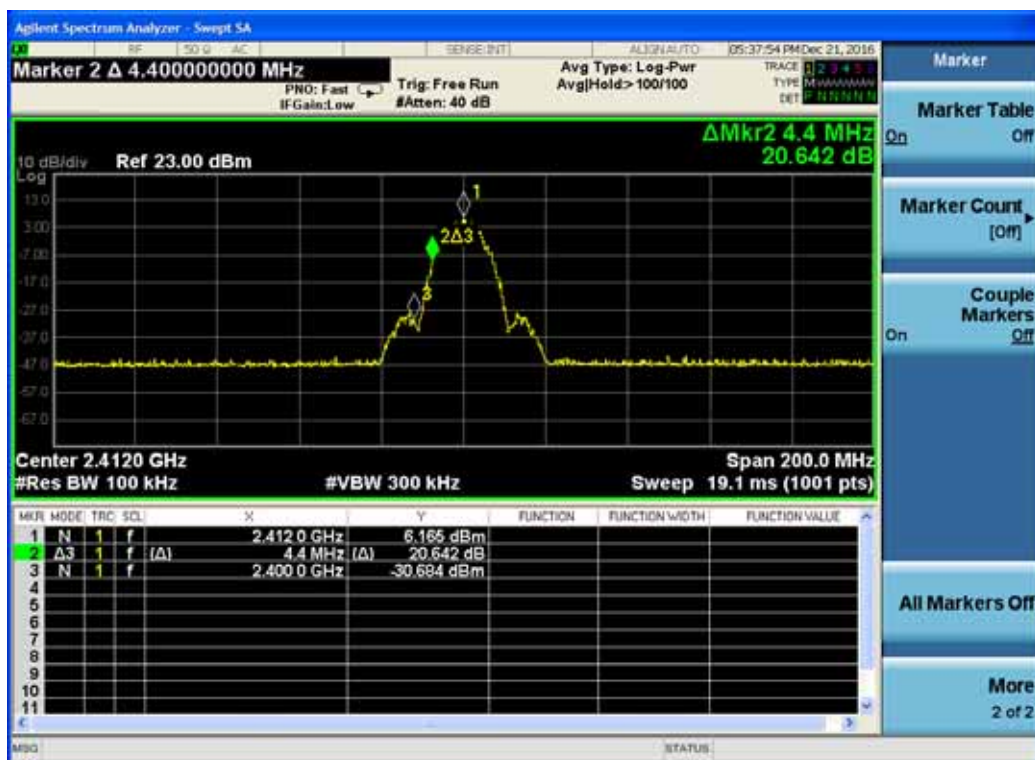
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

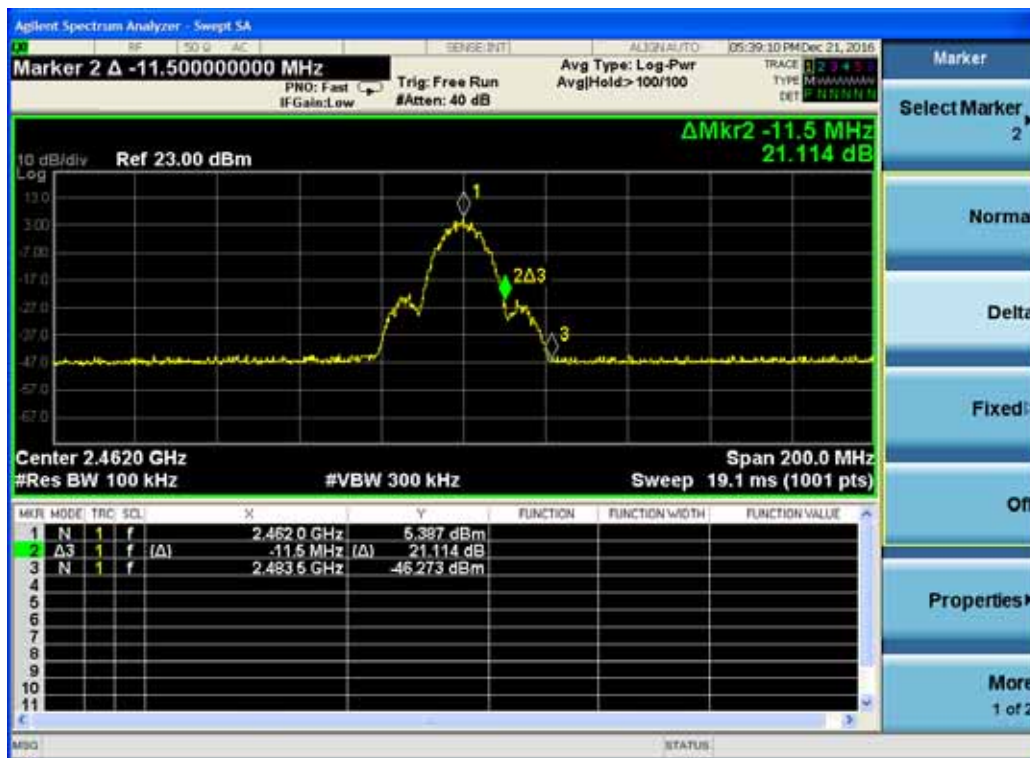
Result plot as follows:

802.11b

Channel 1: 2.412 GHz

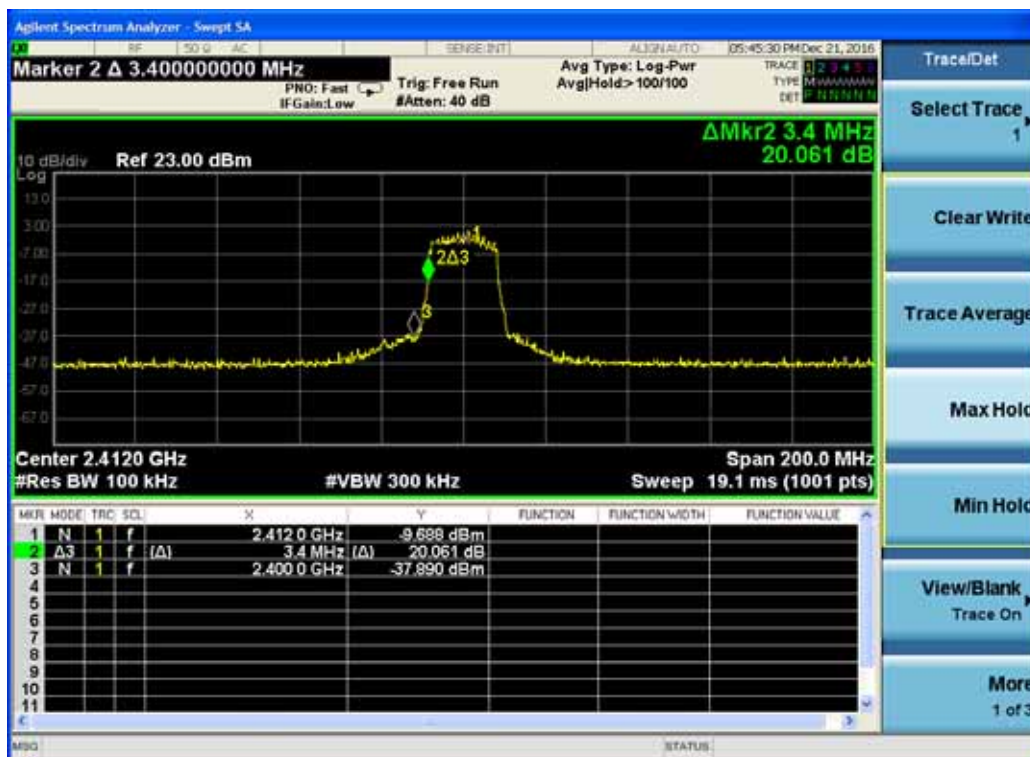


Channel 11: 2.462 GHz

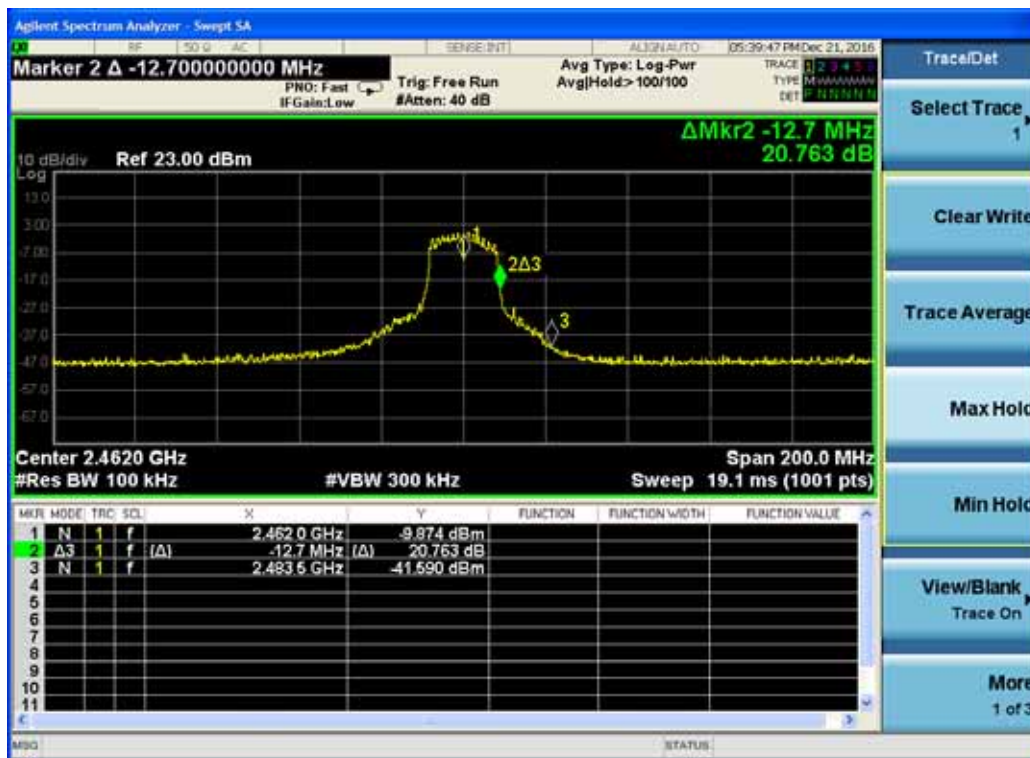


802.11g

Channel 1: 2.412 GHz

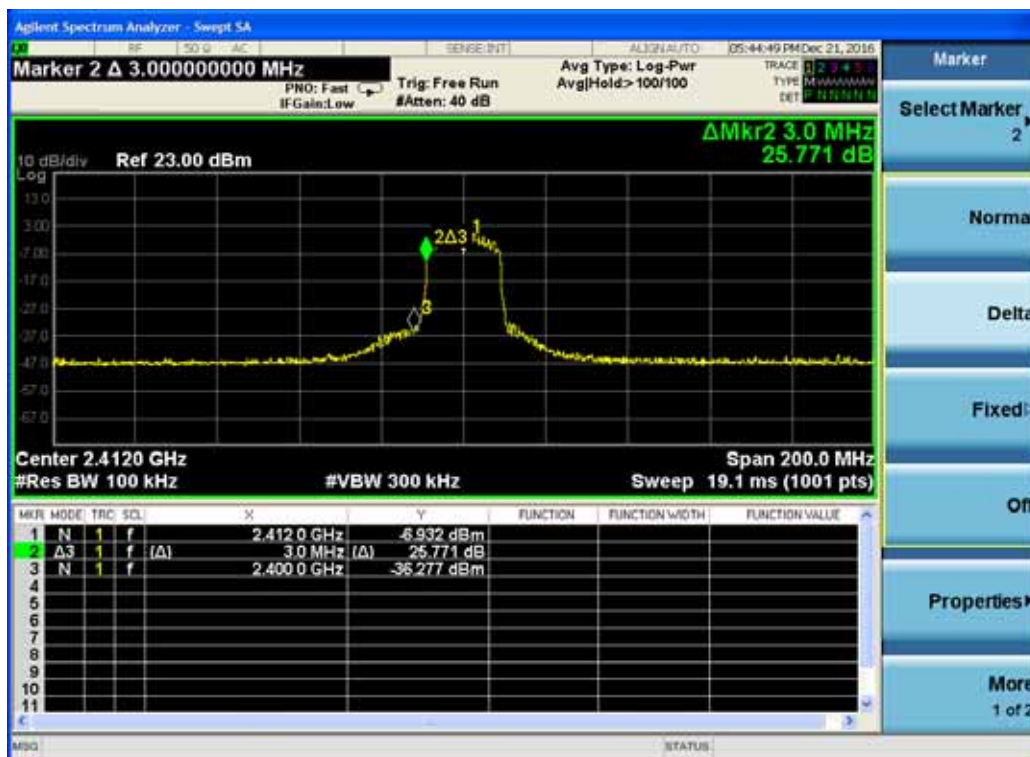


Channel 11: 2.462 GHz

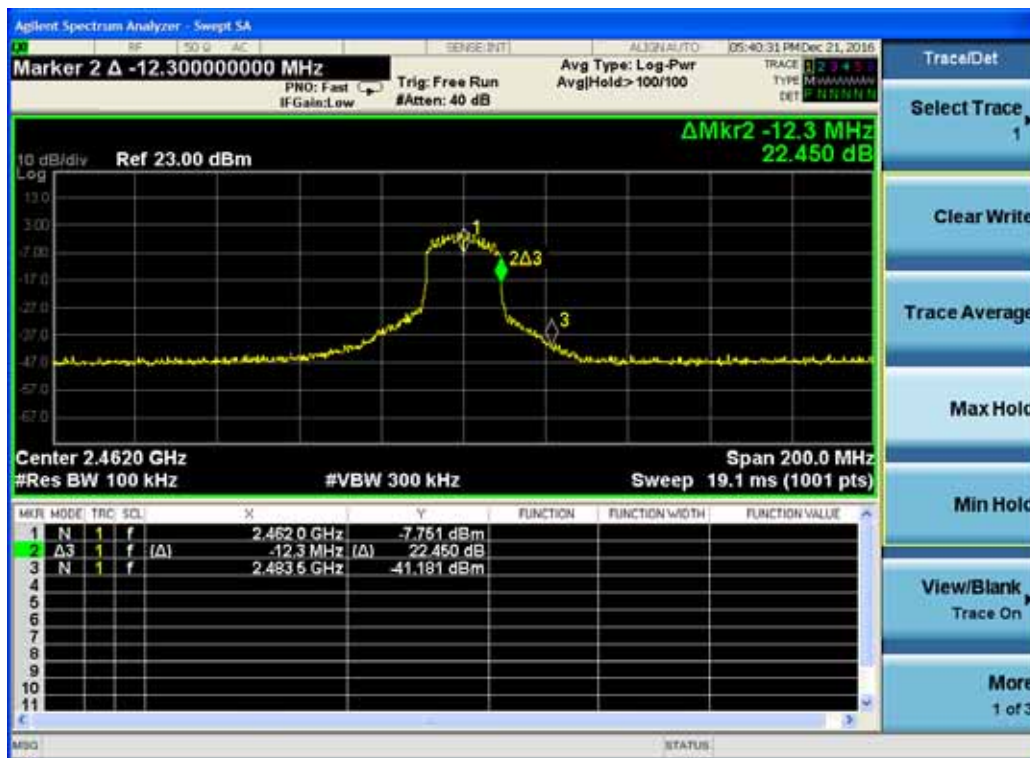


802.11n(HT20)

Channel 1: 2.412 GHz



Channel 11: 2.462 GHz



802.11n(HT40)

Channel 1: 2.422 GHz



Agilent Spectrum Analyzer - Sweep SA

Marker 2 Δ -13.30000000 MHz

PNO: Fast IF Gain: Low Trig: Free Run #Atten: 40 dB

Avg Type: Log-Pwr Avg/Hold: >100/100

Trace B 2 4 2

Trace 1: 1000000000

Ref 23.00 dBm

10 dB/div Log

Center 2.4520 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 200.0 MHz

Sweep 19.1 ms (1001 pts)

MKR	MODE	TRG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.4520 GHz	-21.119 dBm			
2	Δ	1	f	-13.3 MHz (Δ)	24.791 dB			
3	N	1	f	2.4835 GHz	-42.334 dBm			

Test result: The unit does meet the FCC and RSS-247 requirements.

5.10 Conducted Emissions at Mains Terminals 150 kHz to 30MHz

Test Requirement: FCC Part 15 C section 15.207 and RSS-GEN

Test Method: ANSI C63.10:2013 Clause 6.2

Frequency Range: 150 kHz to 30 MHz

Detector: Peak for pre-scan (9 kHz Resolution Bandwidth)

Test Limit

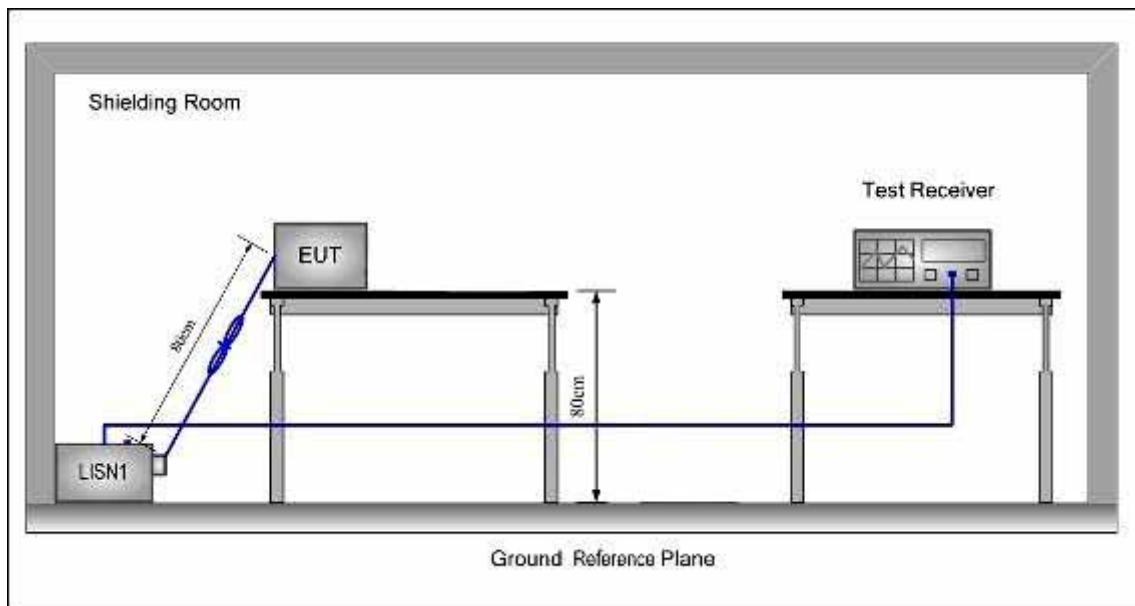
Limits for conducted disturbance at the mains ports of class B

Frequency Range	Class B Limit dB(μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

EUT Operation:

Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture).

Test Configuration:**Test procedure:**

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5.10.1 Measurement Data

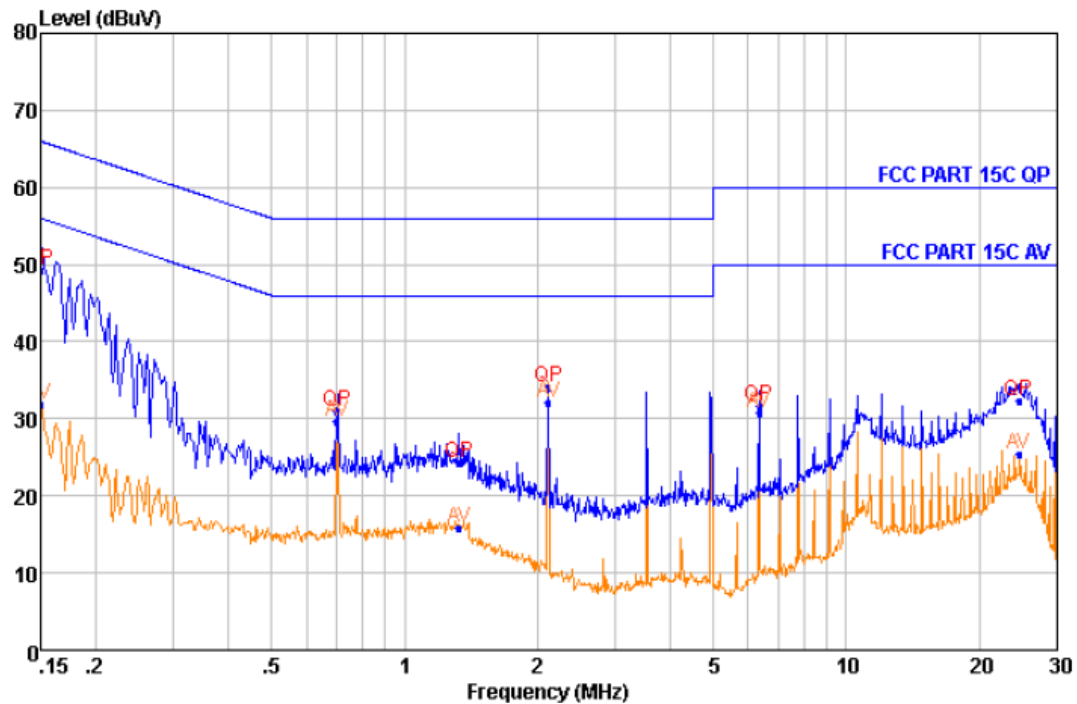
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

The following Quasi-Peak and Average measurements were performed on the EUT
Live line

Peak Scan:

Level (dBμV)



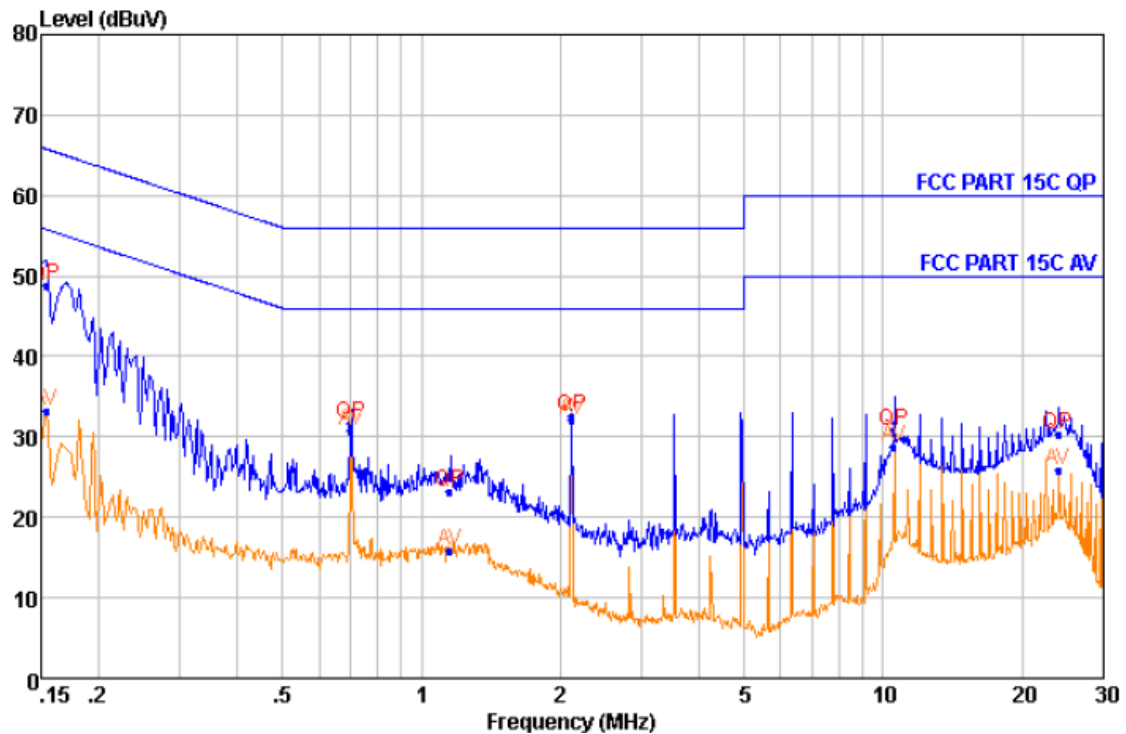
Quasi-peak and Average measurement

NO.	Freq MHz	Level dBμV	Remark	LISN Factor dB	Cable Loss dB	Limit Line dBμV	Over Limit dB
1	0.150	49.34	QP	9.36	0.39	66.00	-16.66
2	0.150	31.91	Average	9.36	0.39	56.00	-24.09
3	0.703	30.94	QP	9.27	0.45	56.00	-25.06
4	0.703	29.72	Average	9.27	0.45	46.00	-16.28
5	1.328	24.40	QP	9.29	0.48	56.00	-31.60
6	1.328	15.73	Average	9.29	0.48	46.00	-30.27
7	2.117	34.03	QP	9.32	0.50	56.00	-21.97
8	2.117	32.12	Average	9.32	0.50	46.00	-13.88
9	6.339	31.66	QP	9.30	0.54	60.00	-28.34
10	6.339	30.74	Average	9.30	0.54	50.00	-19.26
11	24.605	32.25	QP	9.71	0.59	60.00	-27.75
12	24.605	25.39	Average	9.71	0.59	50.00	-24.61

Neutral Line

Peak Scan:

Level (dBμV)



Quasi-peak and Average measurement

NO.	Freq MHz	Level dBμV	Remark	LISN Factor dB	Cable Loss dB	Limit Line dBμV	Over Limit dB
1	0.154	48.83	QP	9.38	0.39	65.78	-16.95
2	0.154	33.23	Average	9.38	0.39	55.78	-22.55
3	0.703	31.66	QP	9.36	0.45	56.00	-24.34
4	0.703	30.82	Average	9.36	0.45	46.00	-15.18
5	1.151	23.08	QP	9.37	0.47	56.00	-32.92
6	1.151	15.85	Average	9.37	0.47	46.00	-30.15
7	2.117	32.55	QP	9.39	0.50	56.00	-23.45
8	2.117	32.09	Average	9.39	0.50	46.00	-13.91
9	10.542	30.86	QP	9.56	0.56	60.00	-29.14
10	10.542	28.67	Average	9.56	0.56	50.00	-21.33
11	23.966	30.28	QP	9.81	0.59	60.00	-29.72
12	23.966	25.89	Average	9.81	0.59	50.00	-24.11

-- End of test report --