FCC RADIO TEST REPORT

According to

FCC Part 15 Subpart C § 15.247

Equipment	:	**Wearable Camera**
Model No	:	**61N**
Applicant	:	**Seers Technology Co., LTD** #1210 Tech Center, SKⓝTechnopark, 124, Sagimakgol-ro, Jungwon-gu, Seongnam-si,Gyeonggi-do, South Korea
Date of reception	:	**July 06, 2016**
Date of test	:	**July 07, 2016 to September 30, 2016**
Report Number	:	**BWS-16-RC-0005**
Report Type	:	**Original Report**
Date of issue	:	**September 30, 2016**
FCC Rule Part(s)	:	**FCC Part 15 Subpart C §15.247**

The product was received on August 9, 2016 and testing was completed on August 30, 2016. We, BWS TECH Inc. would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of BWS TECH Inc. the test report shall not be reproduced except in full.

(Date) 09/30/2016

Tested by **Hyun-Yong, Seol**

(Date)09/30/2016

Reviewed by **Bang-Hyun, Nam**

BWS TECH INC.

#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea
TEL: +82-31-333-5997, FAX: +82-31-333-0017
http://www.bws.co.kr

TABLE OF CONTENTS

FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

1.1 Applicant

● **Company Name**	: Seers Technology Co., Ltd.
● **Company Address**	: :#1210 Tech Center, SKⓝTechnopark, 124, Sagimakgol-ro, Jungwon-gu, Seongnam-si,Gyeonggi-do, South Korea
● **Phone/Fax**	: Tel No. : +82-31-775-3036 Fax No. : +82-31-776-3039

1.2 Manufacturer

● **Company Name**	: Seers Technology Co., Ltd.
● **Company Address**	:#1210 Tech Center, SKⓝTechnopark, 124, Sagimakgol-ro, Jungwon-gu, Seongnam-si,Gyeonggi-do, South Korea
● **Phone/Fax**	: Tel No. : +82-31-775-3036 Fax No. : +82-31-776-3039

1.3 EUT Description

● **Equipment**	: Wearable Camera
● **Model(s)**	: 61N
● **Operation Frequency**	: Bluetooth BLE : 2402MHz ~ 2480MHz 802.11 b/g/n(HT20): 2412MHz-2462MHz
● **Number of Channels**	: Bluetooth BLE : 40 802.11 b/g/n(HT20): 11
● **Modulation Method**	: Bluetooth BLE : 1Mbps GFSK 802.11 b DSSS(CCK, DQPSK,DBPSK) 802.11 g/n(HT20) OFDM (64QAM,16QAM,QPSK, BPSK)
● **Input Voltage**	: 3.7V Lithium polymer battery
● **Antenna Peak Gain**	: -4.61dBi

1.4 Other Information

● **FCC Rule Part(s)**	: Part 15 Subpart C §15.247
● **FCC ID**	: QN8-61N
● **Test Procedure**	: ANSI C63.10-2013 KDB 558074 D01 DTS Meas Guidance v03r05
● **Date of Test**	: August 09, 2016 to August 29, 2016
● **Place of Test**	: BWS TECH Inc. (FCC Registration Number : 287786) #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017

2. Description of Test Facility

Site Description

Test Lab. :

Accredited by Industry Canada, February 10, 2015
The Certificate Registration Number is 4963A-2.

Accredited by FCC, September 03, 2013
The Certificate Registration Number is 287786.

Accredited by VCCI, September 11, 2015
The Certificate Registration Number is C-4326

Accredited by RRA(EMC,RF, SAR), December 16, 2016
The Certificate Registration Number is KR0017

Accredited by KOLAS(KS Q ISO/IEC 17025), April 08, 2016
The Certificate Registration Number is KT174

Name of Firm : BWS TECH Inc.

Site Location : #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea

3. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and the requirements of FCC Rules Part 15.207, 15.209 and 15.247.
Radio testing was performed according to KDB 558074 D01 DTS Meas. Guidance v03r05.

3.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and is operated in a manner that intends to maximize its emission characteristics in a continuous normal application

3.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 FCC Part 15.205 Restricted Bands of Operations

(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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510MHz.
2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.4 Description of Test Modes

The EUT has been tested under operating condition.
The lowest, middle and highest channel were tested as representatives.
After this pre-scan. we choose the following table of the data rata as the worst case.

Freq. Band	Modulation	Worst case data rate
2400~2483.5MHz	802.11b	1Mbps

4. Summary of Test Results

Clause	TEST Description	Standard Section	Requirements	Result
5.1	**AC Power Line Conducted Emission**	§15.207	§15.207(a)	N/A
5.2	**Peak Output Power**	§15.247(b)(3)	≤30dBm	Pass
5.3	**Power Spectral Density**	§15.247(e)	≤8dBm/3kHz	Pass
5.4	**6dB Bandwidth**	§15.247(a)(2)	≥500kHz	Pass
5.5	**Radiated Spurious Emission**	§15.247(d)	§15.209(a)	Pass
5.6	**Conducted Spurious Emission**	§15.247(d)	≥20dBc/100kHz §15.209(a)	Pass
5.7	**Antenna Application**	§15.247(b), §15.203	§15.247(b), §15.203	Pass

REMARK : This EUT is used to Battery

5. Test Data

5.1 AC Power Line Conducted Emission

5.1.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
Test Receiver	ESPI	ROHDE & SCHWARZ	100063	2017/01/08	1 year
#2 Conducted Cable_2.7m	N/A	N/A	N/A	2017/01/08	1 year
LISN	NSLK 8127	SCHWARZBECK	8127-414	2017/01/07	1 year
Impuls-Begrenzer Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	100092	2017/01/06	1 year
CE CHAMBER	N/A	SY Corp.	N/A	N/A	1 year
DC POWER SUPPLY	IPS-30B03DD	INTERACT	00420502	2017/09/10	1 year

5.1.2 Test Limit

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

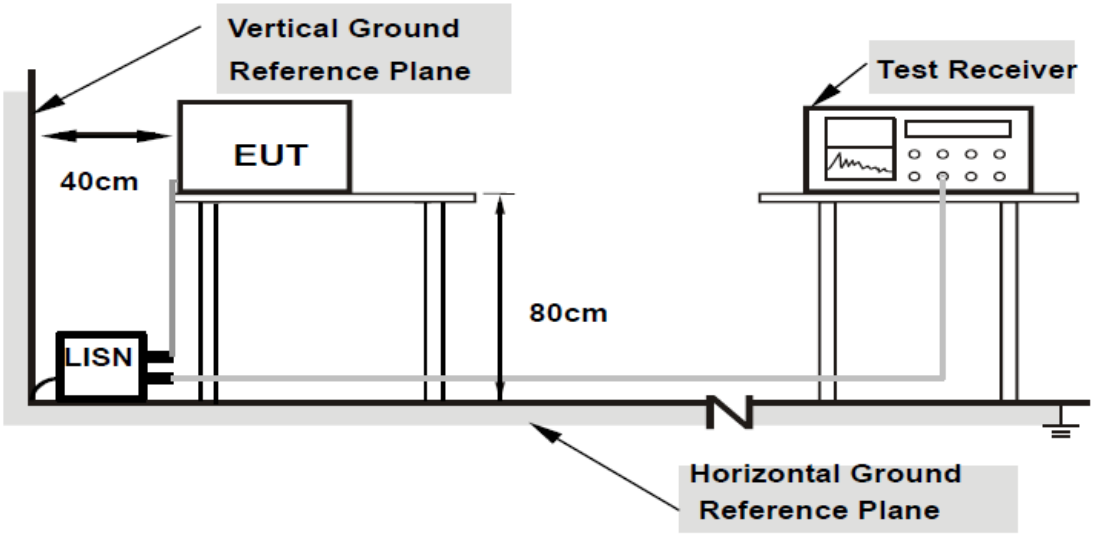
Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

5.1.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room and was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network(LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 uH LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

5.1.4 Block Diagram of Test Setup



5.1.5 Test Result : N/A

5.2 Peak Output Power Measurement

5.2.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
Power Sensor	RPR3006W	DARE	14I00048S NO09	2017/04/25	1 Year
DC Power Supply	UDP-6015R	Unicorn tech	131007	2017/09/10	1 Year

5.2.2 Test Limit

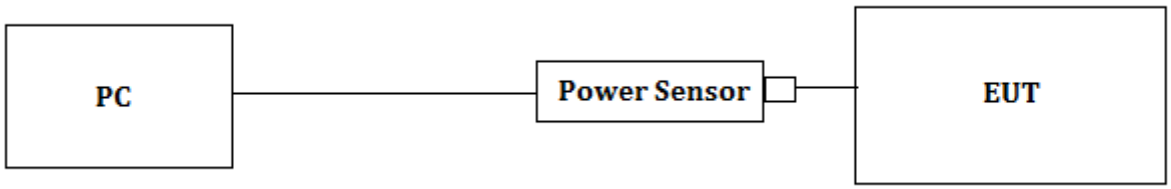
The maximum peak power shall be less than 1 Watt (30dBm).

Note: If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the direction gain of the antenna exceeds 6dBi, In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

5.2.3 Measurement Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the power meter. The path loss was compensated to the results for each measurement.
3. Set to the maximum output power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.

5.2.4 Test SET-UP (Block Diagram of Configuration)



5.2.5 Test Result

Test mode: BLE

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
0	2402	6.0	≤30	Pass
19	2440	6.6	≤30	Pass
39	2480	6.7	≤30	Pass

Test mode: 802.11b

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412	7.35	≤30	Pass
6	2437	7.12	≤30	Pass
11	2462	7.05	≤30	Pass

Test mode: 802.11g

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412	7.12	≤30	Pass
6	2437	7.16	≤30	Pass
11	2462	6.98	≤30	Pass

Test mode: 802.11n

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412	7.05	≤30	Pass
6	2437	7.10	≤30	Pass
11	2462	7.03	≤30	Pass

5.3 Power Spectral Density

5.3.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
Spectrum Analyzer	FSV30	ROHED&SCHWARZ	100832	2017/09/07	1 Year
DC Power Supply	UDP-6015R	Unicorn tech	131007	2017/09/10	1 Year

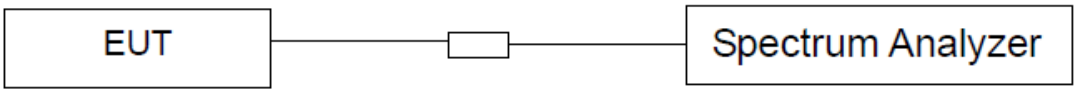
5.3.2 Test Limit

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

5.3.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set (RBW = 3 kHz, VBW = 10 kHz, Detector = Peak, Span = 1.5 times DTS Channel Bandwidth, Trace mode = Max Hold, Sweep = Auto).
5. Measure and record the results in the test report.

5.3.4 Block Diagram of Test Setup



5.3.5 Test Result

Test mode: BLE

Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
0	2402	-7.03	≤8	Pass
19	2440	-6.21	≤8	Pass
39	2480	-5.94	≤8	Pass

Test mode: 802.11b

Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
1	2412	-9.99	≤8	Pass
6	2437	-10.32	≤8	Pass
11	2462	-9.84	≤8	Pass

Test mode: 802.11g

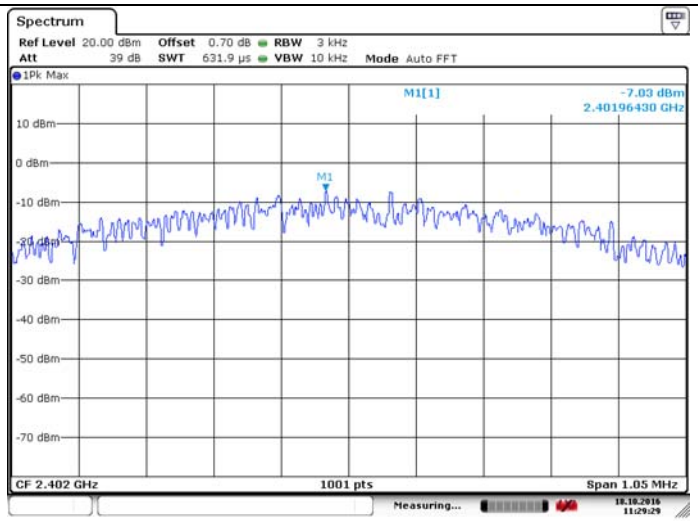
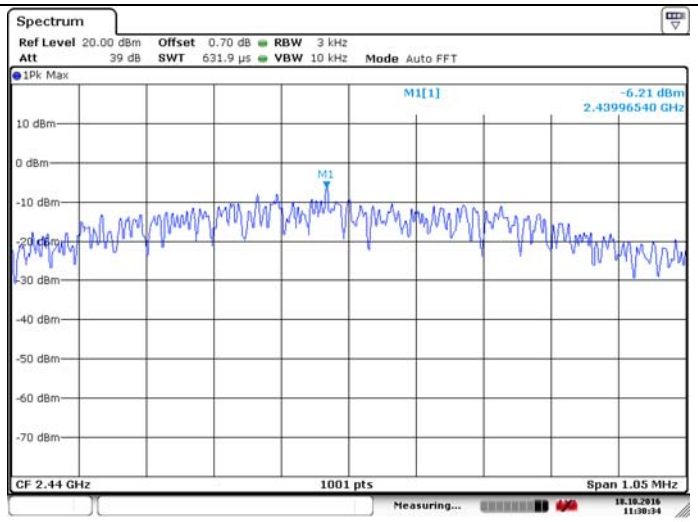
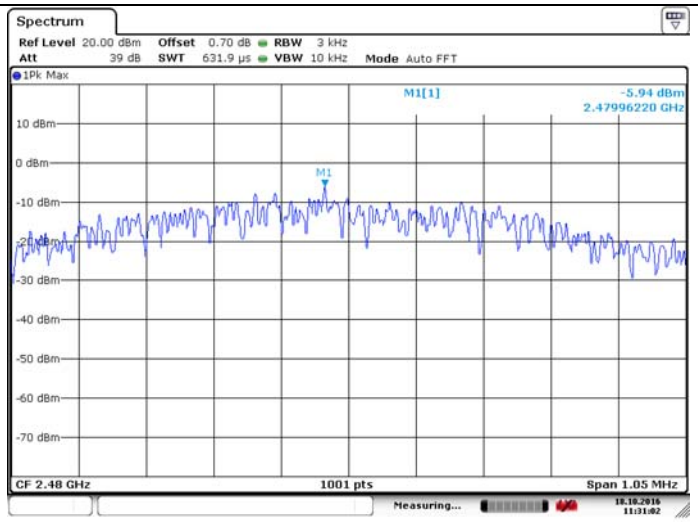
Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
1	2412	-12.52	≤8	Pass
6	2437	-12.74	≤8	Pass
11	2462	-12.01	≤8	Pass

Test mode: 802.11n

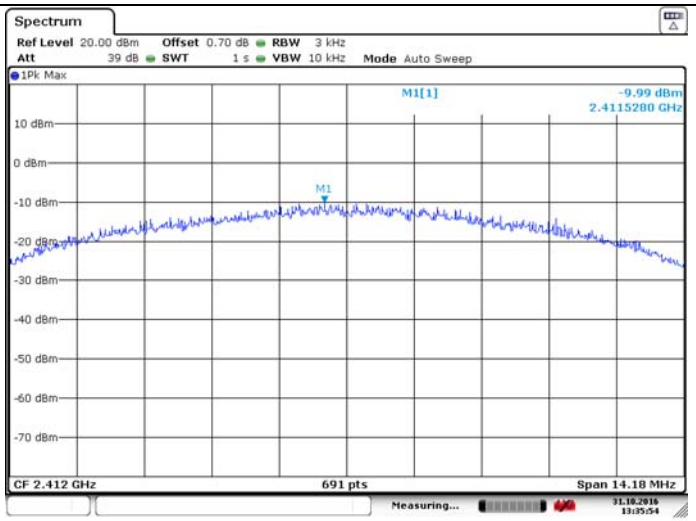
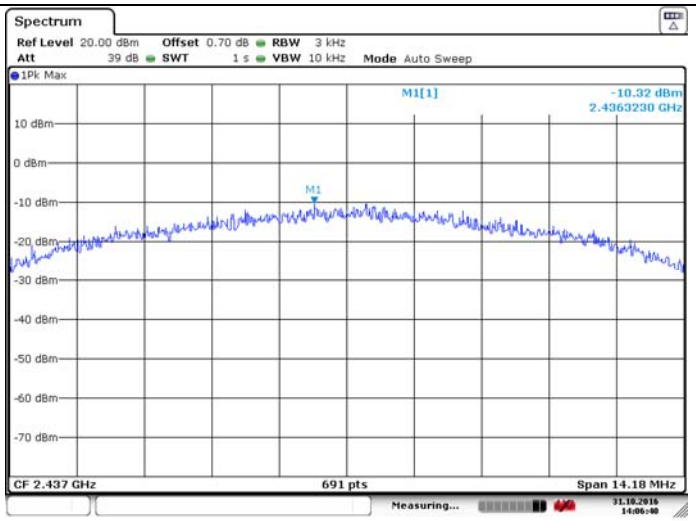
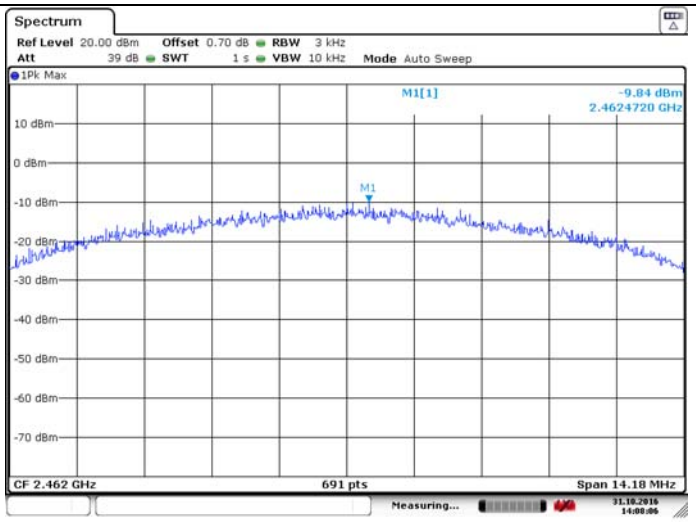
Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
1	2412	-12.94	≤8	Pass
6	2437	-13.46	≤8	Pass
11	2462	-13.49	≤8	Pass

5.3.5 Test Plot

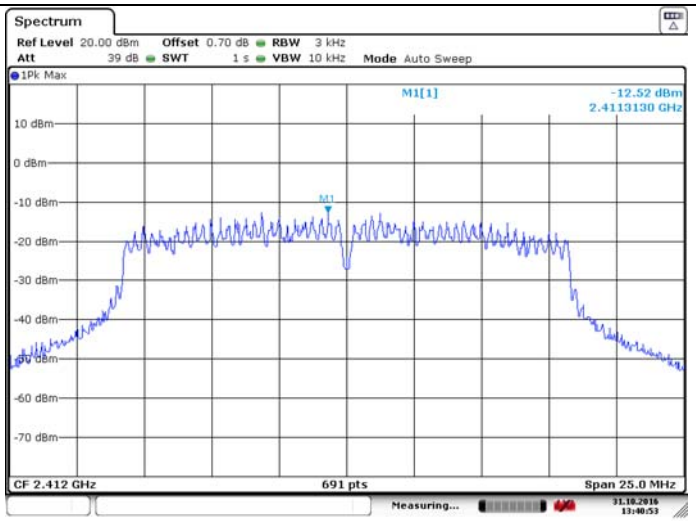
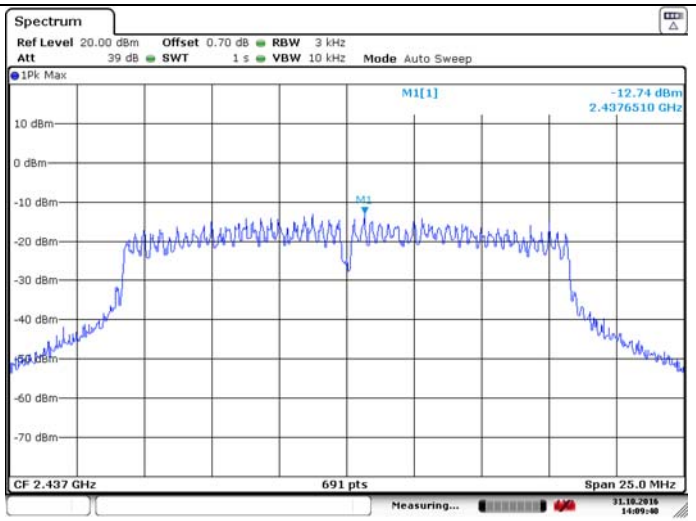
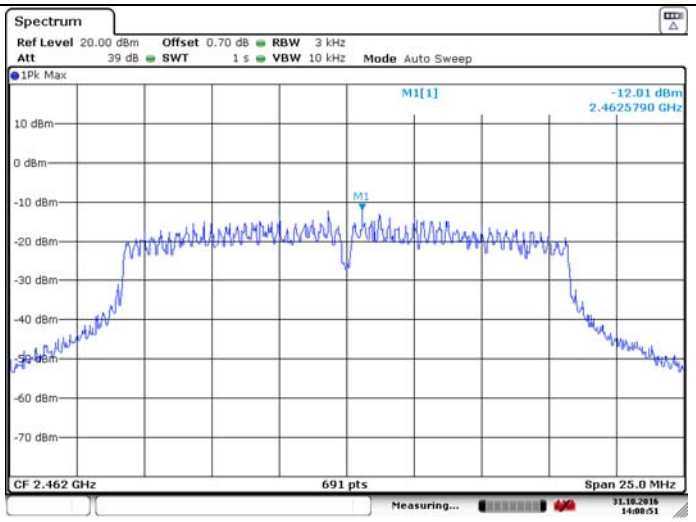
Test mode: BLE

Power Spectral Density	
2402 MHz (Channel 00)	
2440 MHz (Channel 19)	
2480 MHz (Channel 39)	

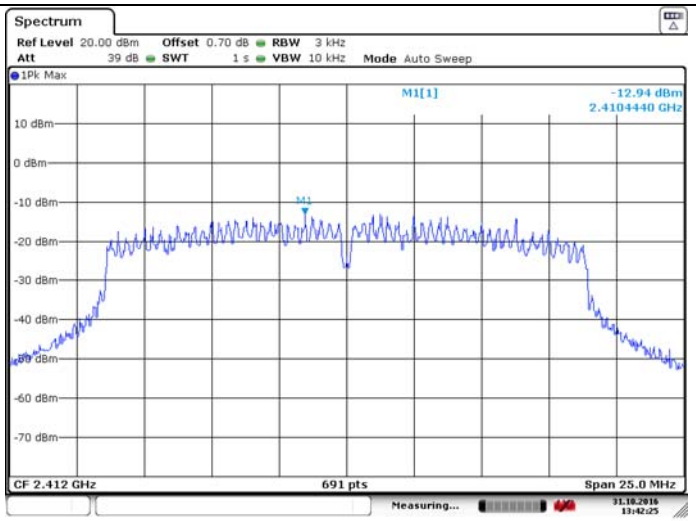
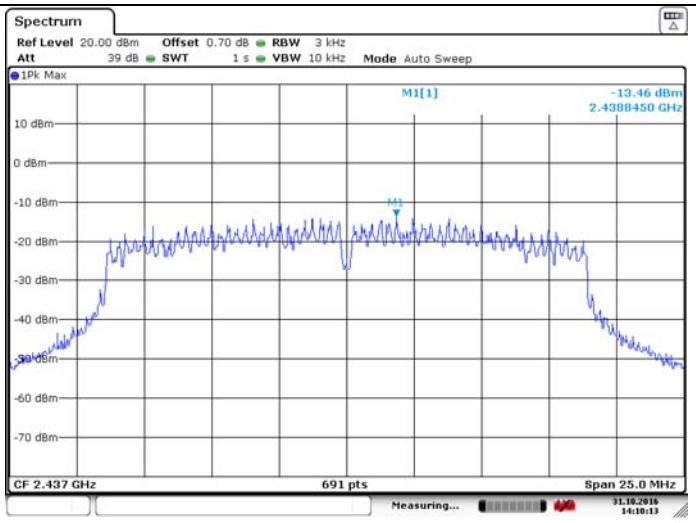
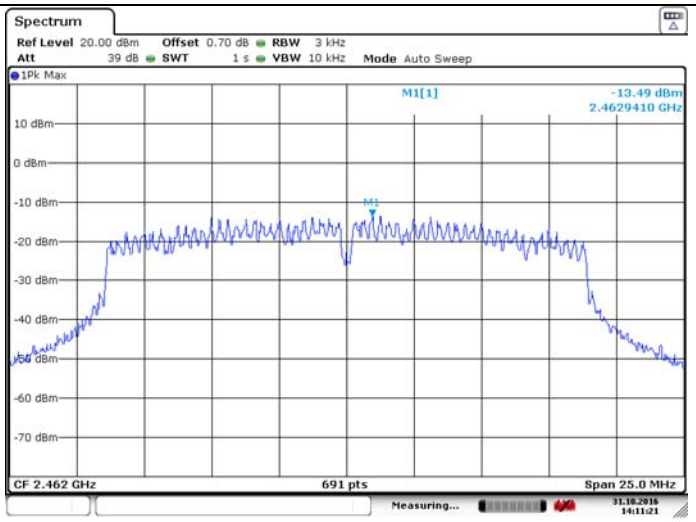
Test mode: 802.11b

Power Spectral Density	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

Test mode: 802.11g

Power Spectral Density	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

Test mode: 802.11n

Power Spectral Density	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

5.4 6dB Spectrum Bandwidth

5.4.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
Spectrum Analyzer	FSV30	ROHED&SCHWARZ	100832	2017/09/07	1 Year
DC Power Supply	UDP-6015R	Unicorn tech	131007	2017/09/10	1 Year

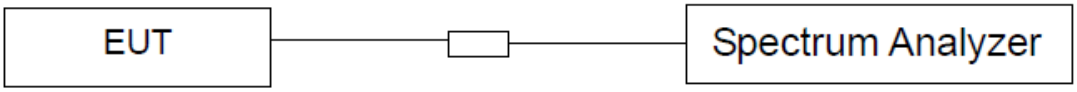
5.4.2 Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

5.4.3 Measurement Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set (RBW = 100 kHz, VBW = 300 kHz, Detector = Peak, Trace mode = Max Hold, Sweep = Auto).
5. Measure and record the results in the test report.

5.4.4 Test SET-UP (Block Diagram of Configuration)



5.4.5 Test Result

Test mode: BLE

Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Min. Limit (kHz)	Result
0	2402	705	500	Pass
19	2440	692	500	Pass
39	2480	685	500	Pass

Test mode: 802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	9.42	500	Pass
6	2437	9.68	500	Pass
11	2462	8.67	500	Pass

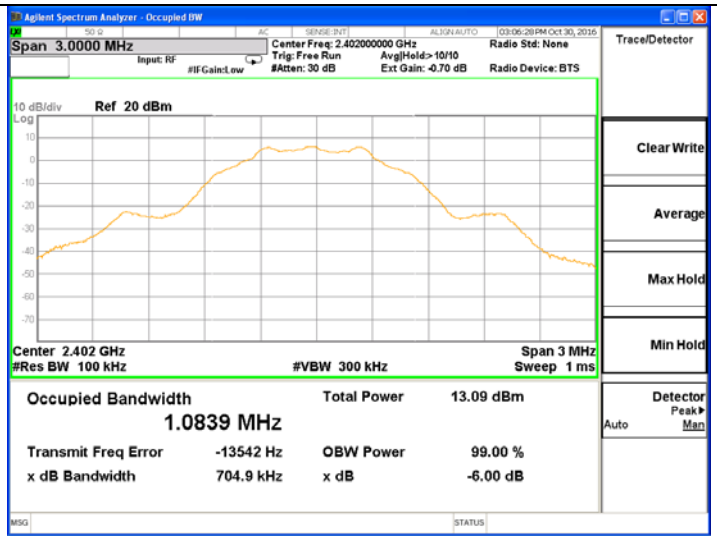
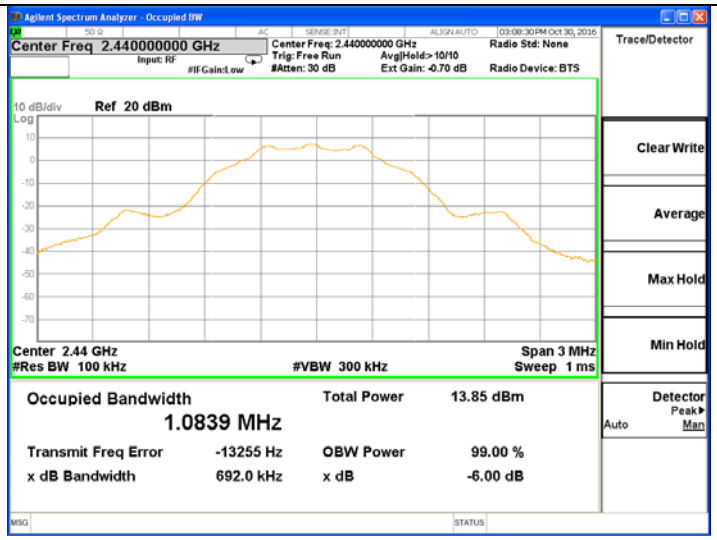
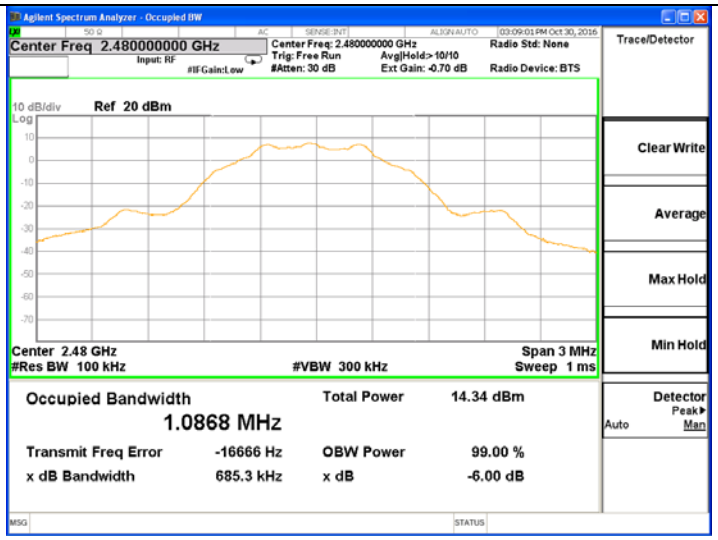
Test mode: 802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	15.40	500	Pass
6	2437	15.17	500	Pass
11	2462	15.41	500	Pass

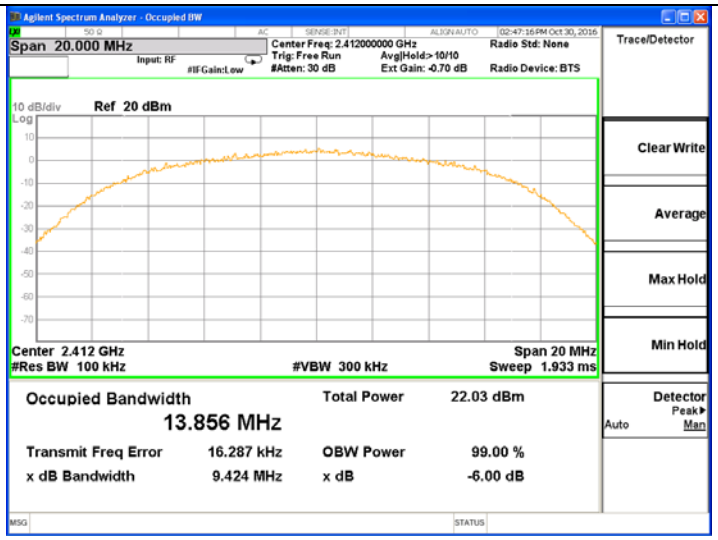
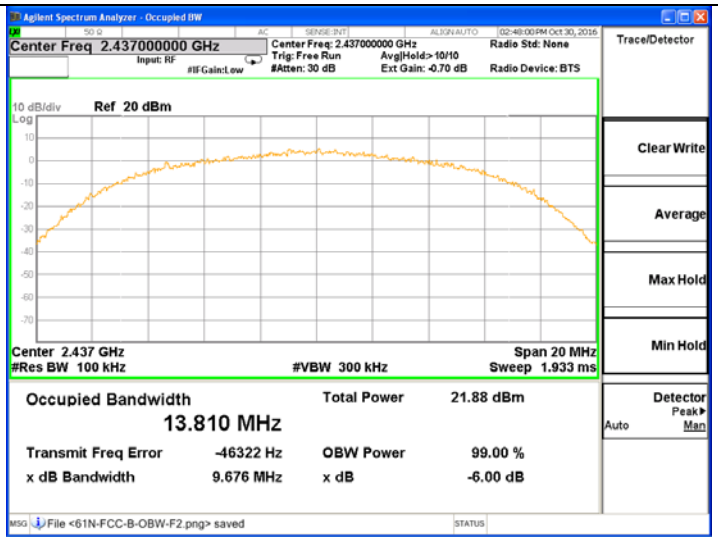
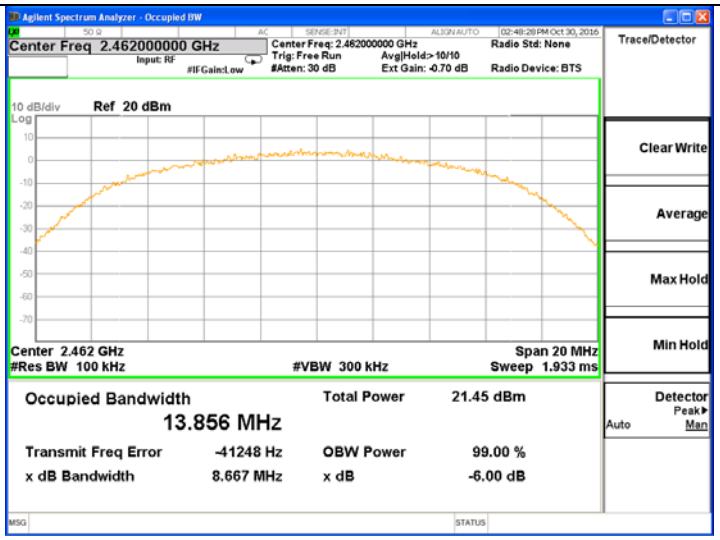
Test mode: 802.11n

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	15.39	500	Pass
6	2437	15.39	500	Pass
11	2462	16.07	500	Pass

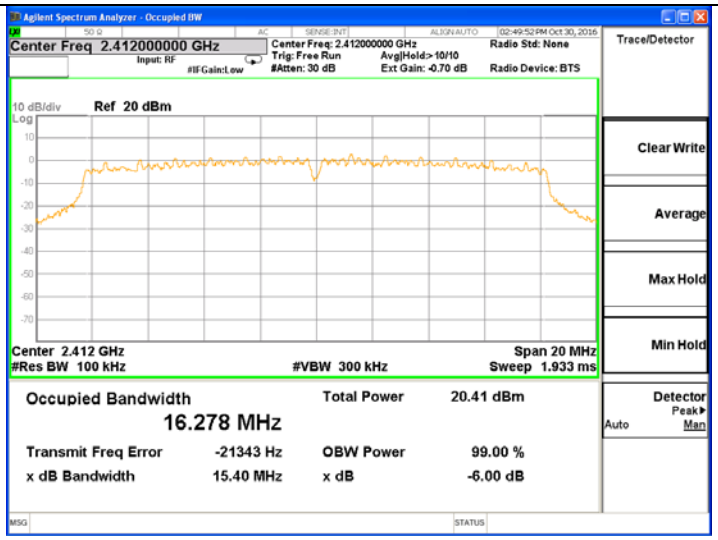
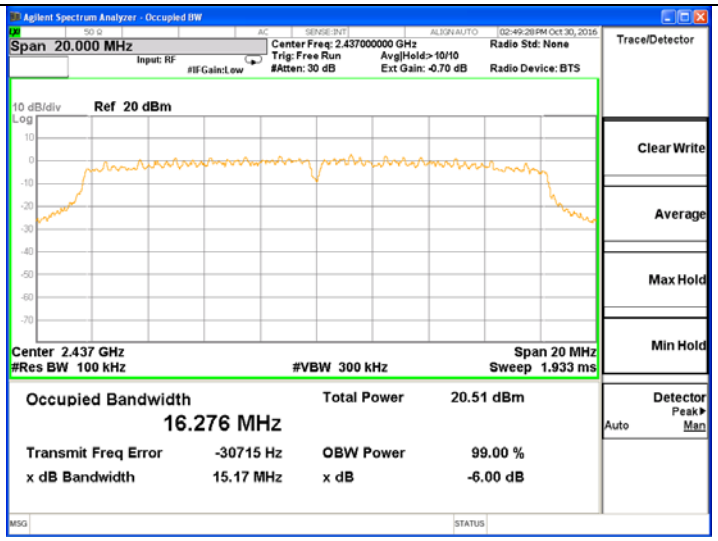
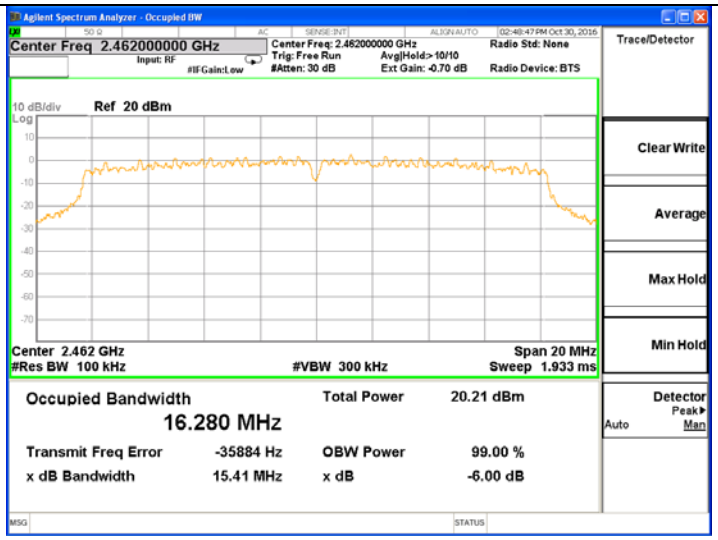
5.4.5 Test Plot
Test mode: BLE

6dB Bandwidth	
2402 MHz (Channel 00)	
2440 MHz (Channel 19)	
2480 MHz (Channel 39)	

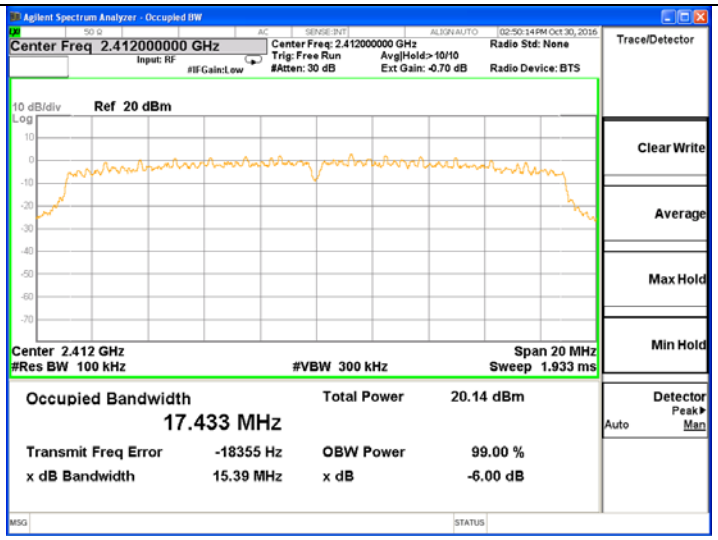
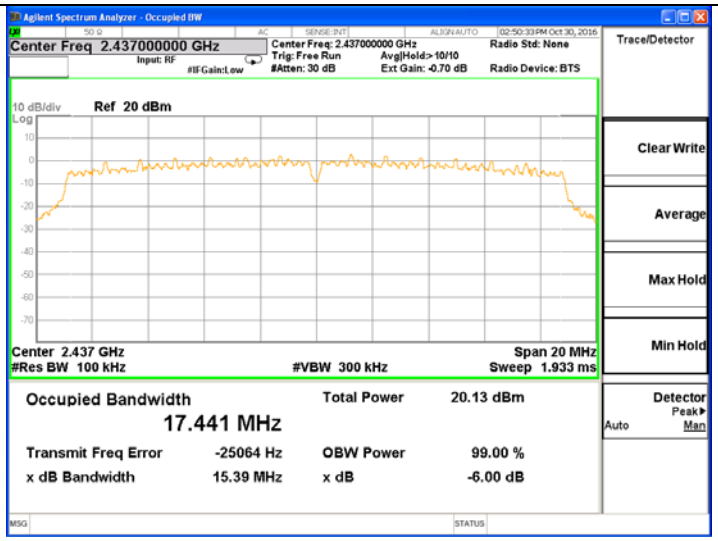
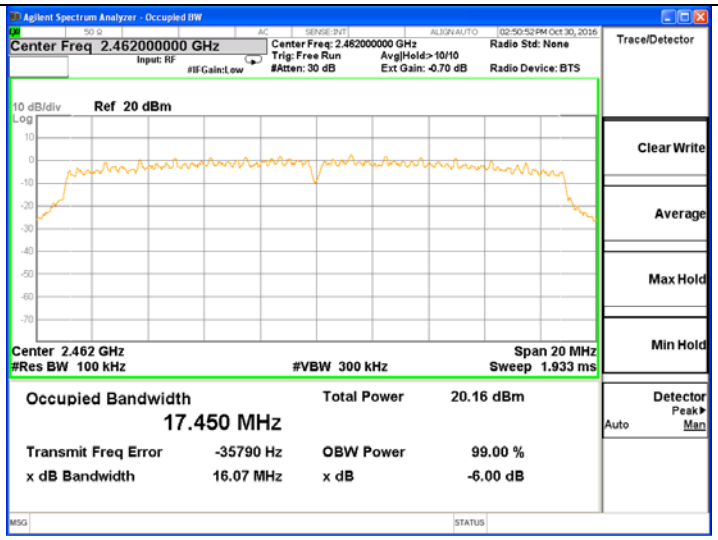
Test mode: 802.11b

6dB Bandwidth	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

Test mode: 802.11g

6dB Bandwidth	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

Test mode: 802.11n

6dB Bandwidth	
2412 MHz (Channel 1)	
2437 MHz (Channel 6)	
2462 MHz (Channel 11)	

5.5 Radiated Spurious Emission

5.5.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
EMI Receiver	ESR	Rohde & Schwarz	101320	2017/03/25	1 Year
Bilog Antenna	VULB9160	Schwarzbeck	9160-3052	2017/10/06	2 Year
Antenna Mast(4m)	AM-4.0	MATURO	AM4.0/225/17240915	-	-
Antenna Mast(2m)	AM-2.5	MATURO	AM2.5/226/17240915	-	-
Positioner Controller	CO2000	MATURO	NCU/459/17240915		-
Loop Antenna	HEH2-Z2	Rohde & Schwarz	881056/6	2017/01/06	2 Year
Horn Antenna	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D 234	2017/09/03	2 Year
Horn Antenna	BBHA 9170	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170157	2017/11/14	2 Year
Amplifier	LPA-10-20	RF Bay	11160801	2017/03/25	1 Year
RF Amplifier	PAM-118A	COM-POWER	551019	2017/07/20	1 Year
RE_10 m CHAMBER #1	N/A	SY Corp.	N/A	N/A	-

5.5.2 Test Limit

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

Frequency (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

5.5.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.

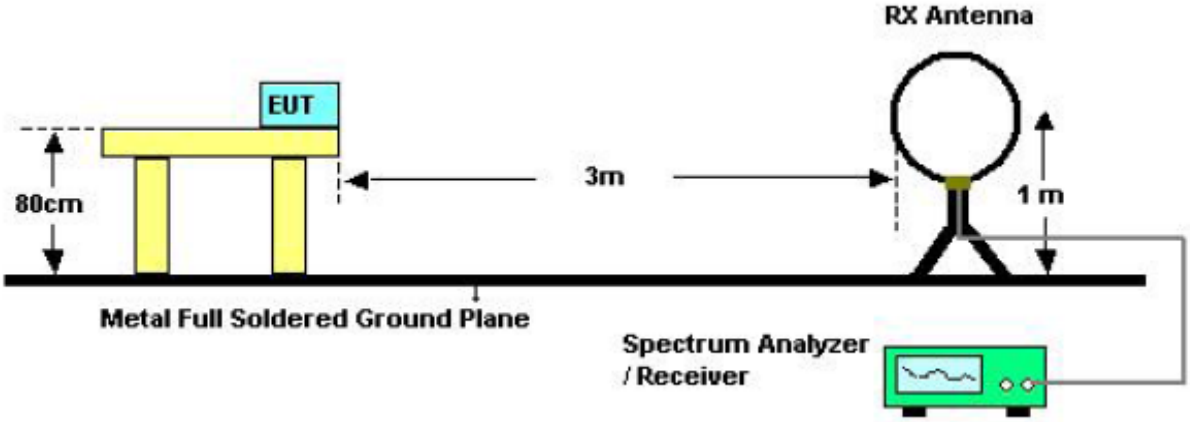
3. The EUT was placed on a turntable. For emissions testing at or below 1 GHz, the table height was 80cm above the reference ground plane. For emission measurements above 1 GHz, the table height was 1.5m.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings and peak emission levels are measured :
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW (9-150kHz: 200Hz, 0.15-30MHz: 9kHz, 30-1000MHz: 120kHz, above 1GHz: 1MHz).
   (3) VBW ≥ 3 x RBW ; Sweep = auto; Detector function = peak; Trace = max hold

   For average measurement:
   • VBW = 10 Hz, when duty cycle is no less than 98 percent.
   • VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

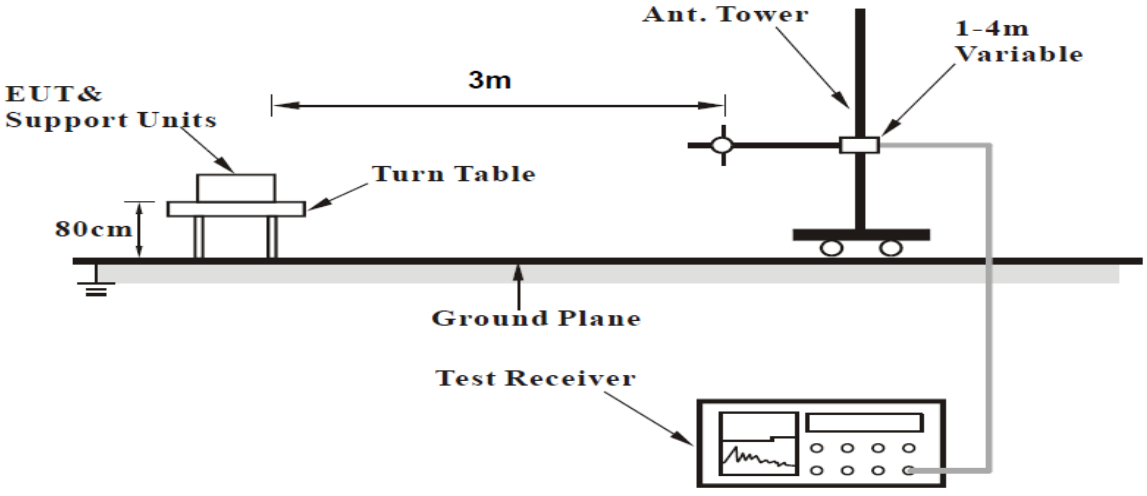
8. Measure and record the results in the test report.

5.5.4 Test SET-UP (Block Diagram of Configuration)

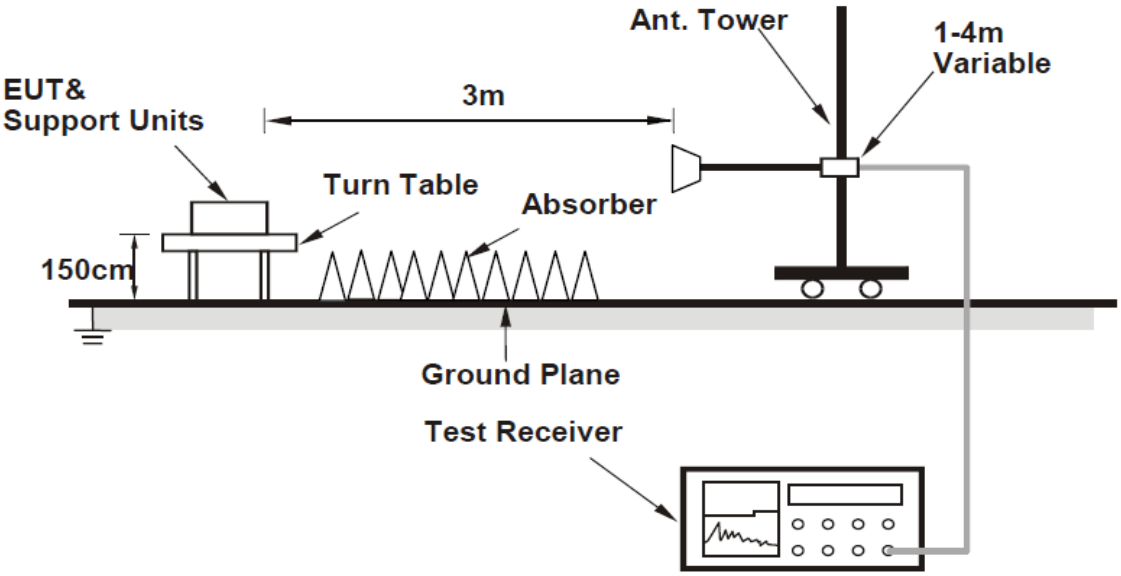
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



5.5.5 Test Result

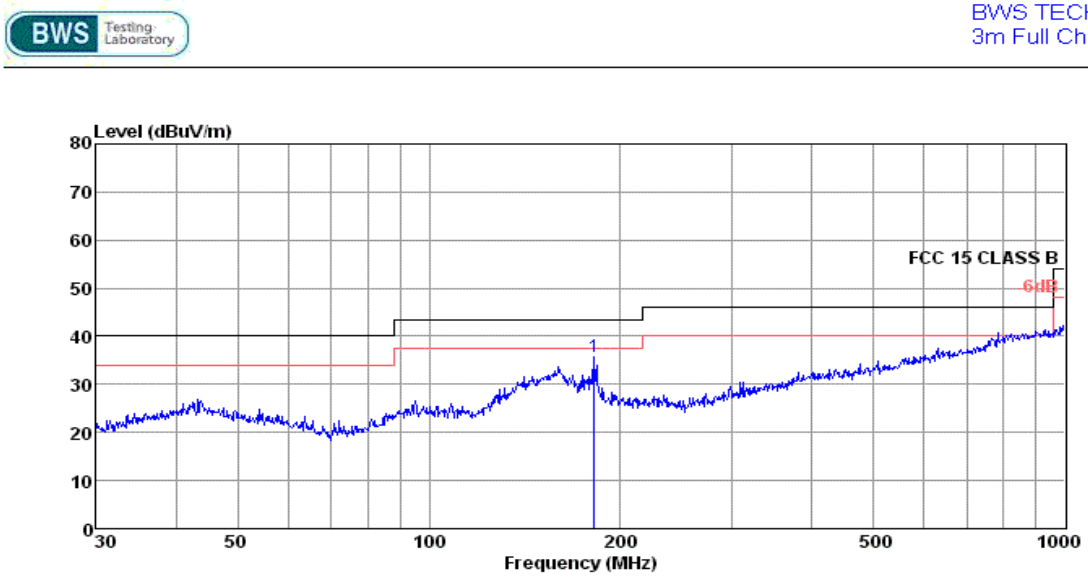
5.5.5.1 Frequency Below 30MHz

Frequency [MHz]	Reading [dB μV]	Polari-zation [H/V]	Correction Factor [dB]	Result [dB μV/m]	Limit [dB μV/m]	Margin [dB]	State
-	-	-	-	-	-	-	PASS

Remark: §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.

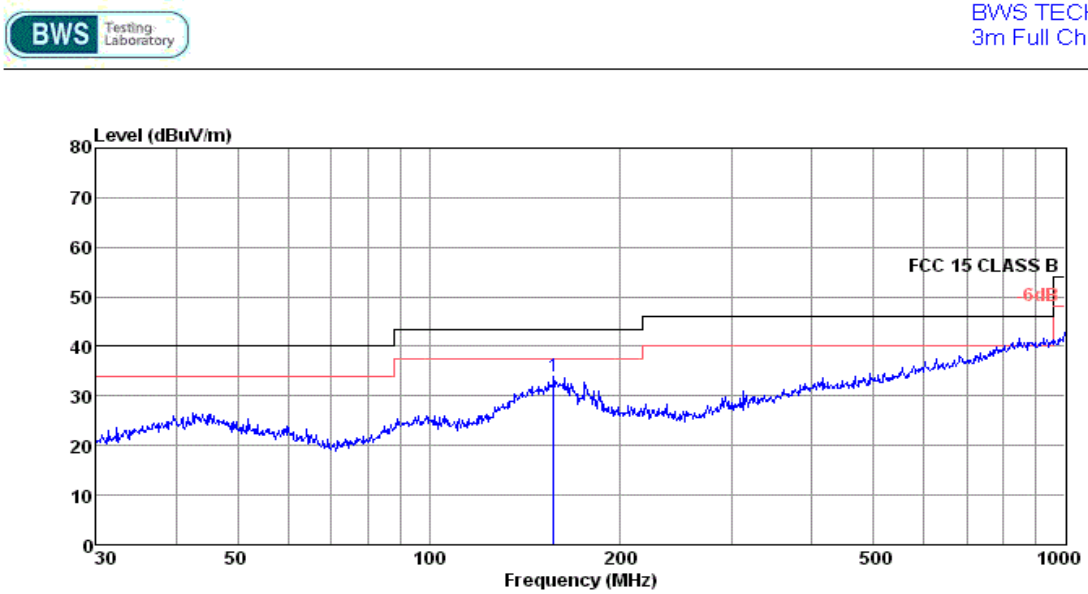
5.5.5.2 Frequency Below 1000MHz

Test mode: lowest Channel (2412MHz)



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	uV/m	dBuV/m	dB	cm	deg	
1 q	181.92	21.68	14.08	61	43.50	-7.74	115	285	QP

Test mode: middle Channel (2437MHz)

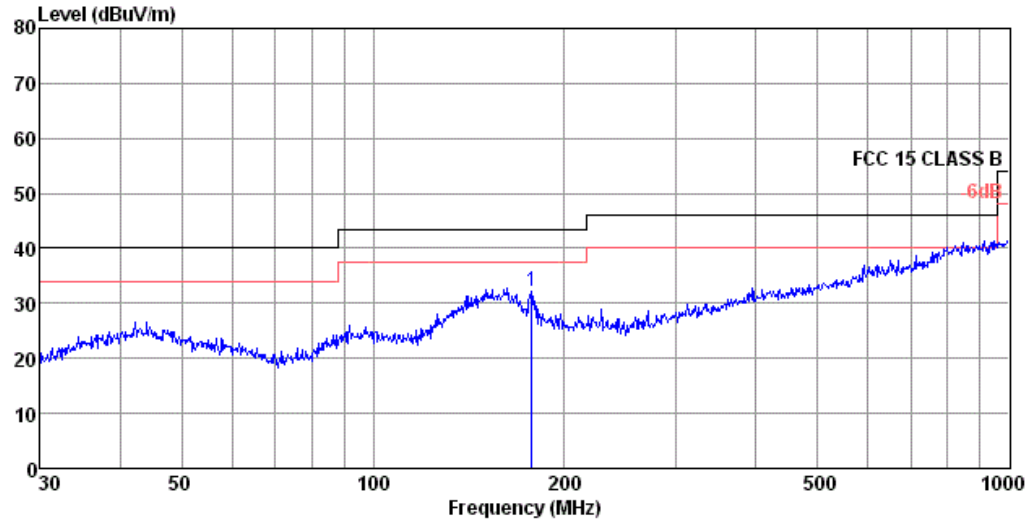


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	uV/m	dBuV/m	dB	cm	deg	
1 q	157.01	14.39	19.46	49	43.50	-9.65	120	254	QP

Test mode: highest Channel (2462MHz)

BWS Testing Laboratory

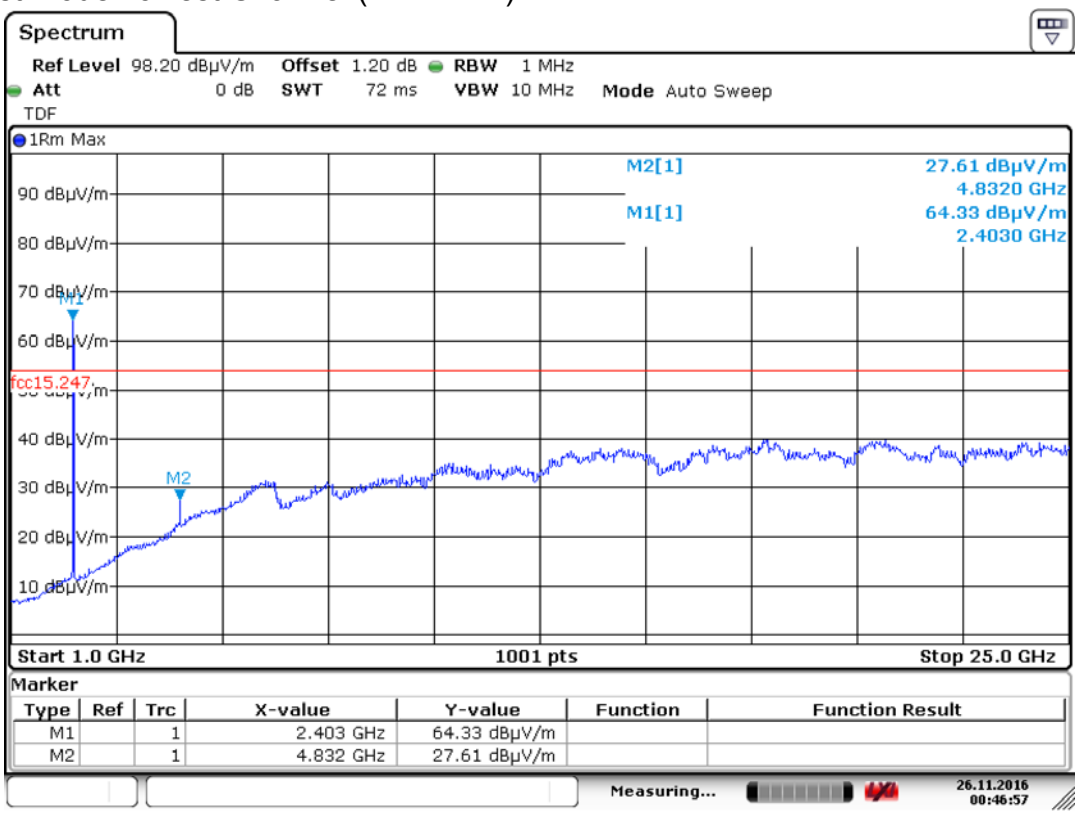
BWS TECH INC.
3m Full Chamber



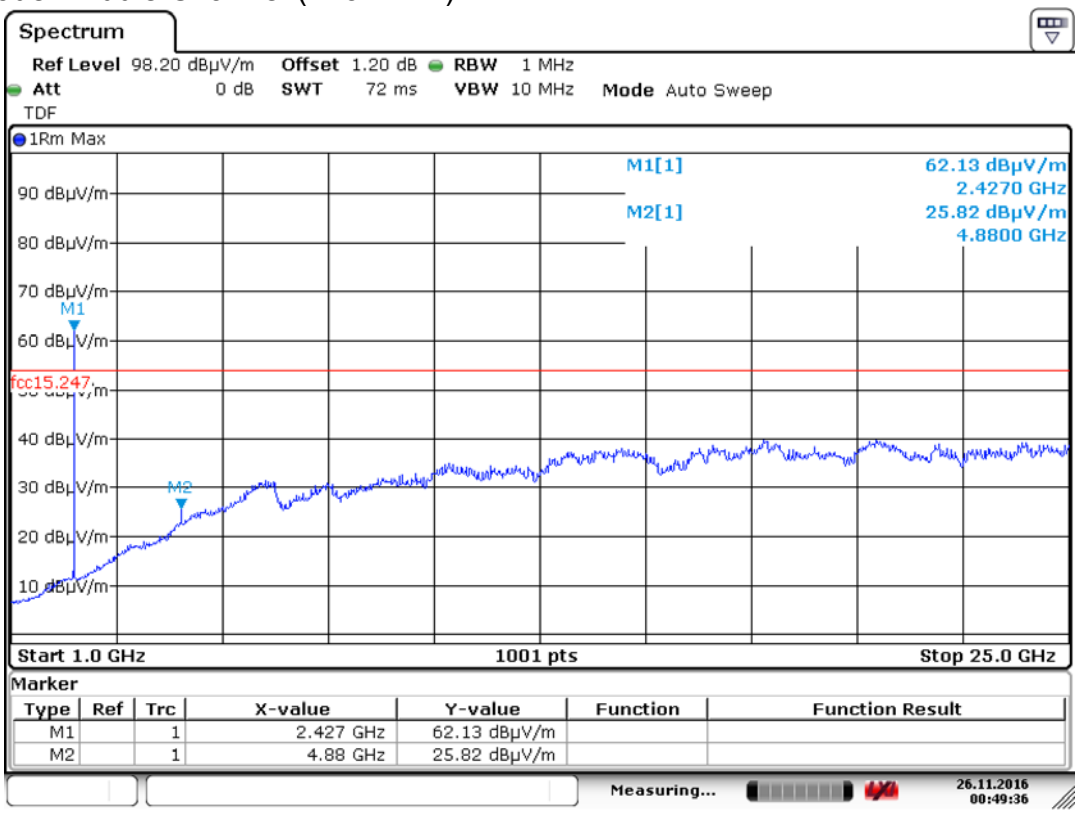
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	uV/m	dBuV/m	dB	cm	deg	
1 q	177.51	17.19	14.85	40	43.50	-11.46	120	268	QP

5.5.5.3 Frequency above 1 GHz

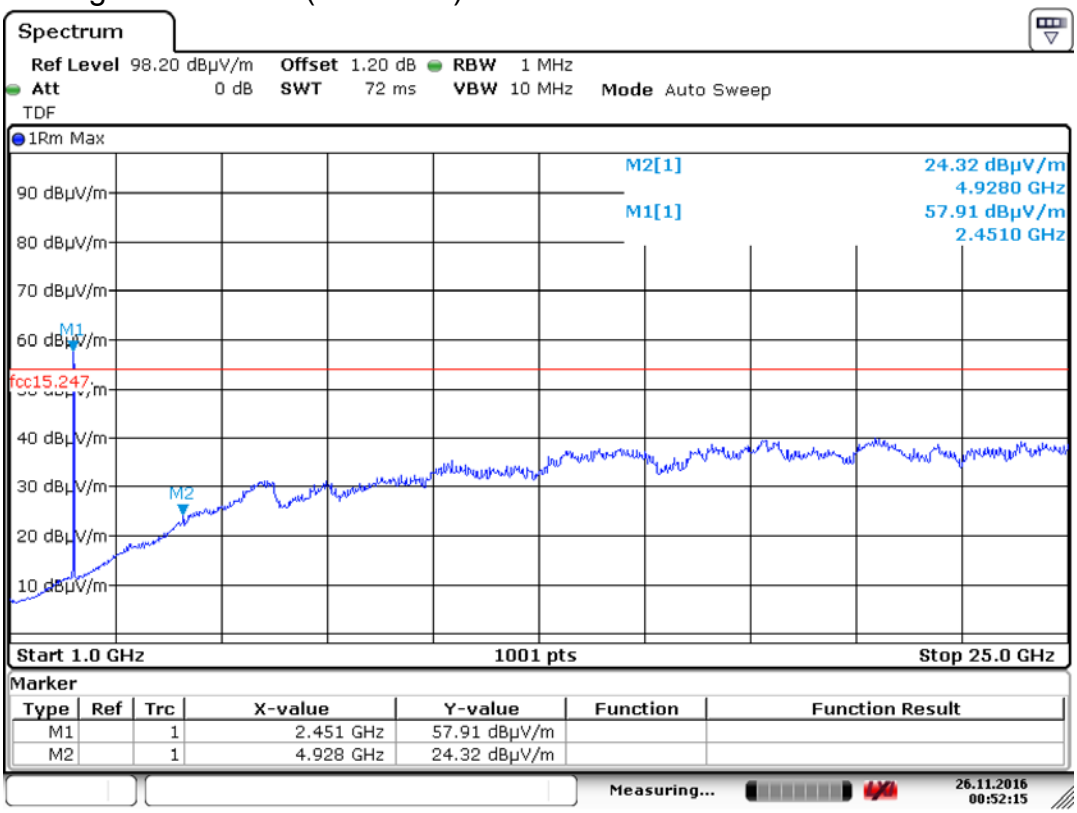
Test mode: lowest Channel (2412MHz)



Test mode: middle Channel (2437MHz)



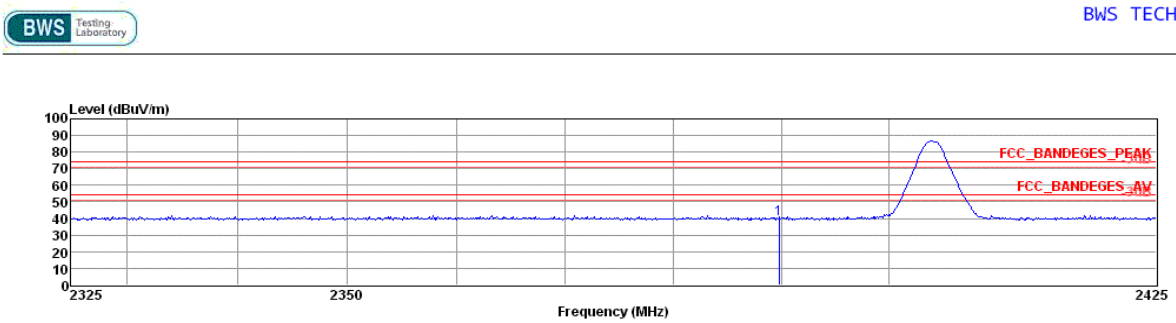
Test mode: highest Channel (2462MHz)



[Radiated Band Edges Test]

The Test result is record to the worst case test data.

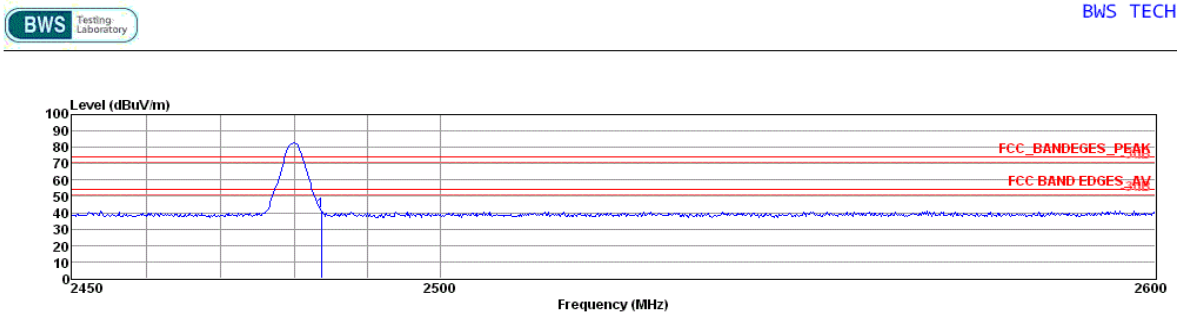
Test Mode: BLE (2402MHz)



Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	ReadLevel	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2389.72	38.44	26.74	31.20	5.72	39.70	74.00	-34.30	100	103	Peak

Test Mode: BLE (2480MHz)



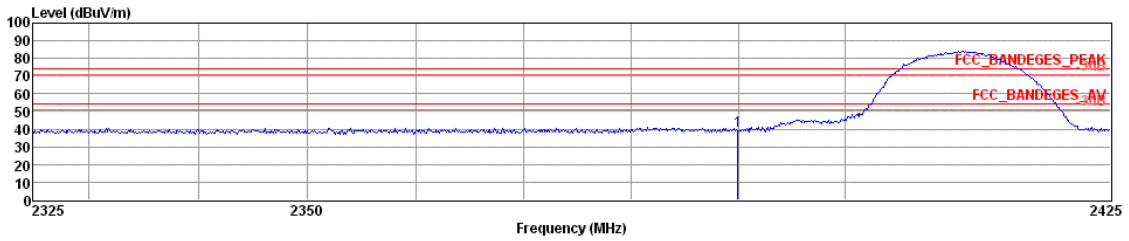
Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	ReadLevel	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2483.72	39.44	26.86	30.97	5.56	40.89	74.00	-33.11	100	240	Peak

Remark: Correction Factor[dB] = Antenna Factor[dB] + Cable Factor[dB] – Pre-amplifier Factor[dB],
Result [dB μV/m] = Reading [dB μV] + Correction Factor [dB],
Margin[dB] = Limit [dB μV/m] - Result [dB μV/m]

Test Mode: 802.11b (2412MHz)

BWS TECH INC

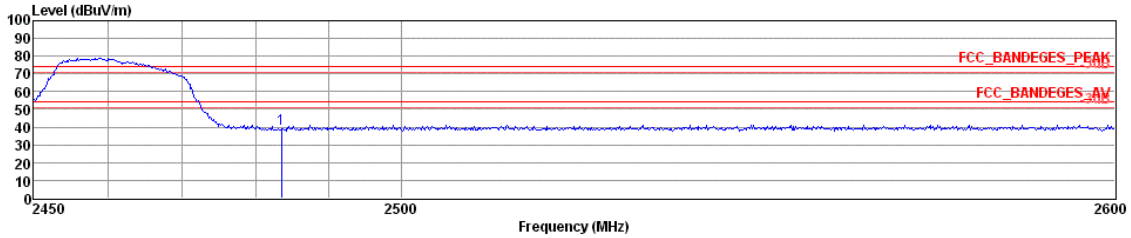


Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2389.92	38.12	26.74	31.20	5.72	39.38	74.00	-34.62	100	145	Peak

Test Mode: 802.11b (2462MHz)

BWS TECH INC



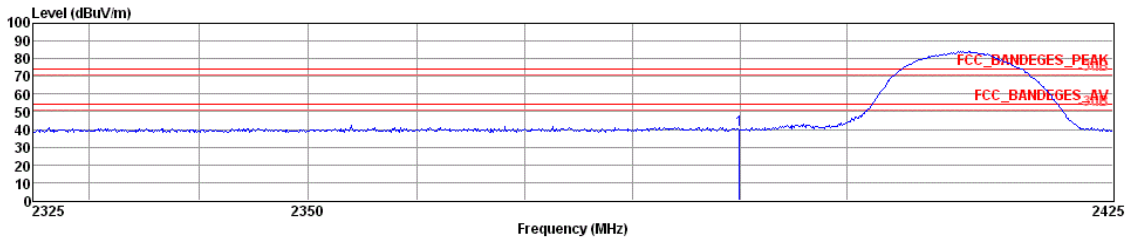
Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2483.57	37.32	26.86	30.97	5.56	38.77	74.00	-35.23	100	117	Peak

Remark: Correction Factor[dB] = Antenna Factor[dB] + Cable Factor[dB] – Pre-amplifier Factor[dB],
Result [dB μV/m] = Reading [dB μV] + Correction Factor [dB],
Margin[dB] = Limit [dB μV/m] - Result [dB μV/m]

Test Mode: 802.11g (2412MHz)

BWS TECH INC

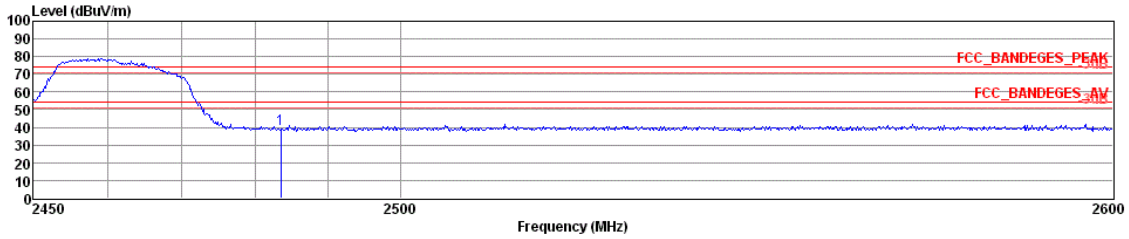


Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2389.92	38.75	26.74	31.20	5.72	40.01	74.00	-33.99	100	235	Peak

Test Mode: 802.11g (2462MHz)

BWS TECH INC



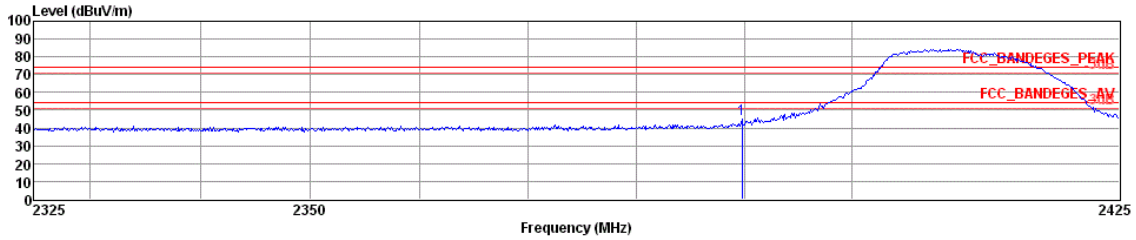
Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2483.57	37.38	26.86	30.97	5.56	38.83	74.00	-35.17	100	262	Peak

Remark: Correction Factor[dB] = Antenna Factor[dB] + Cable Factor[dB] – Pre-amplifier Factor[dB],
Result [dB μV/m] = Reading [dB μV] + Correction Factor [dB],
Margin[dB] = Limit [dB μV/m] - Result [dB μV/m]

Test Mode: 802.11n (2412MHz)

BWS TECH INC

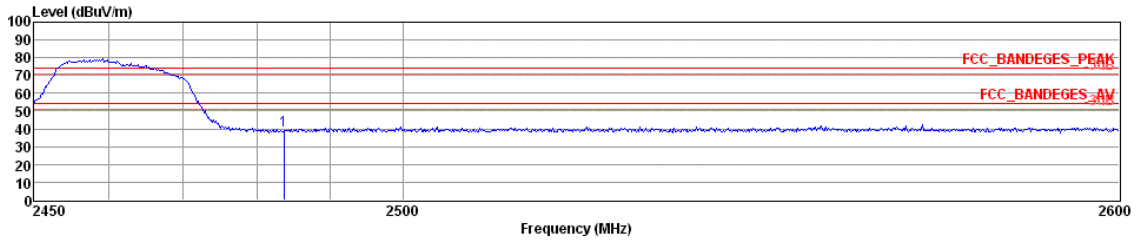


Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2389.72	43.87	26.74	31.20	5.72	45.13	74.00	-28.87	100	105	Peak

Test Mode: 802.11n (2462MHz)

BWS TECH INC



Site : SVSWR Chamber
Condition: FCC_BANDEGES_PEAK 3m BBHA9120D517_2014

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	A/Pos	T/Pos	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg	
1	2483.72	37.55	26.86	30.97	5.56	39.00	74.00	-35.00	100	142	Peak

Remark: Correction Factor[dB] = Antenna Factor[dB] + Cable Factor[dB] – Pre-amplifier Factor[dB],
Result [dB μV/m] = Reading [dB μV] + Correction Factor [dB],
Margin[dB] = Limit [dB μV/m] - Result [dB μV/m]

5.6 Conducted Spurious Emission

5.6.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)	Calibration Interval
Spectrum analyzer	N9020A	Agilent	US46220101	2017/09/14	1 Year

5.6.2 Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

5.6.3 Test Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v03r03” (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

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.

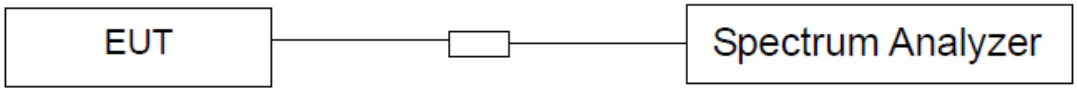
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

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.

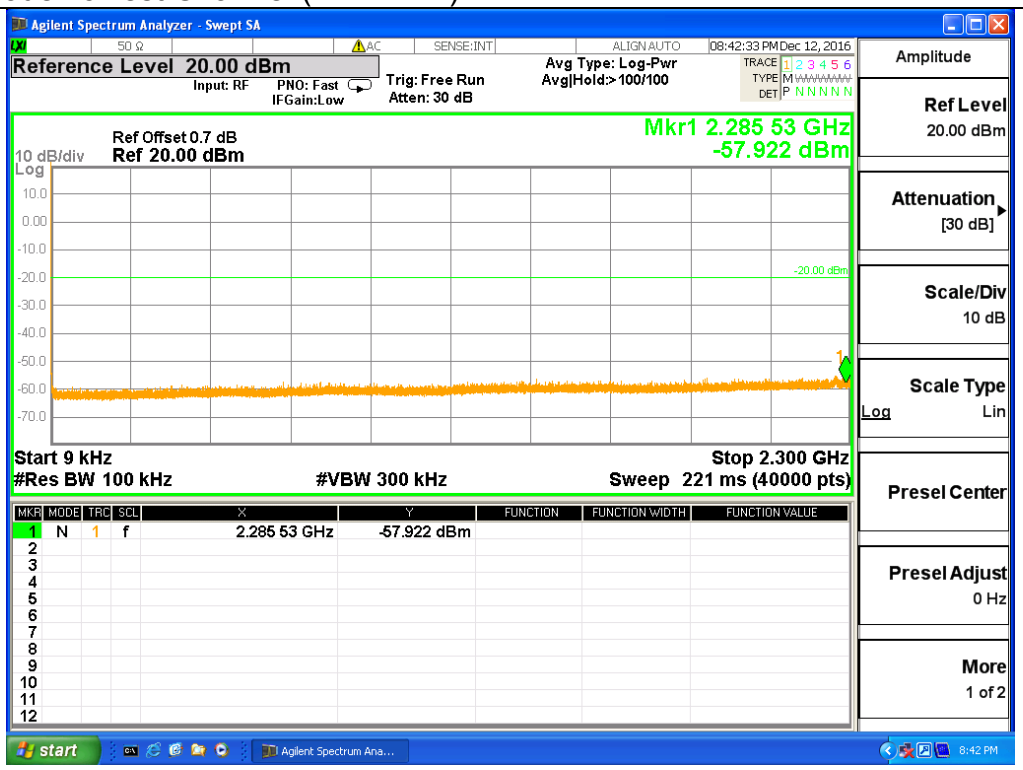
5.6.4 Test SET-UP (Block Diagram of Configuration)

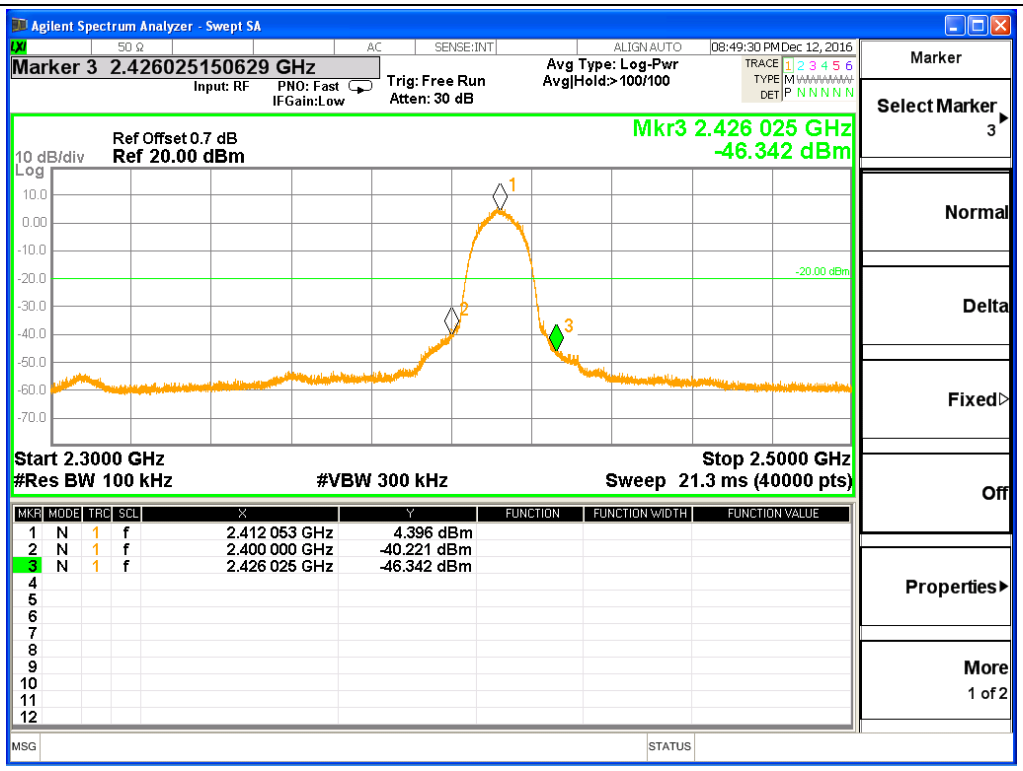
Conducted Emission Test Set-Up, Frequency above 1000MHz

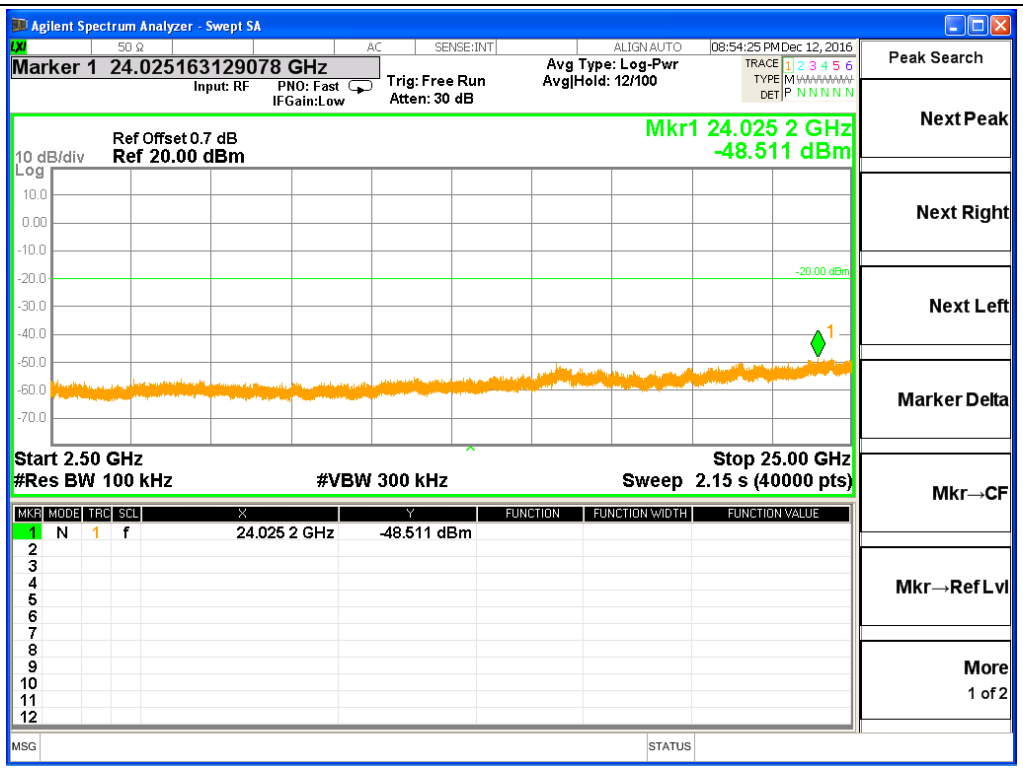


5.6.5 Test Result

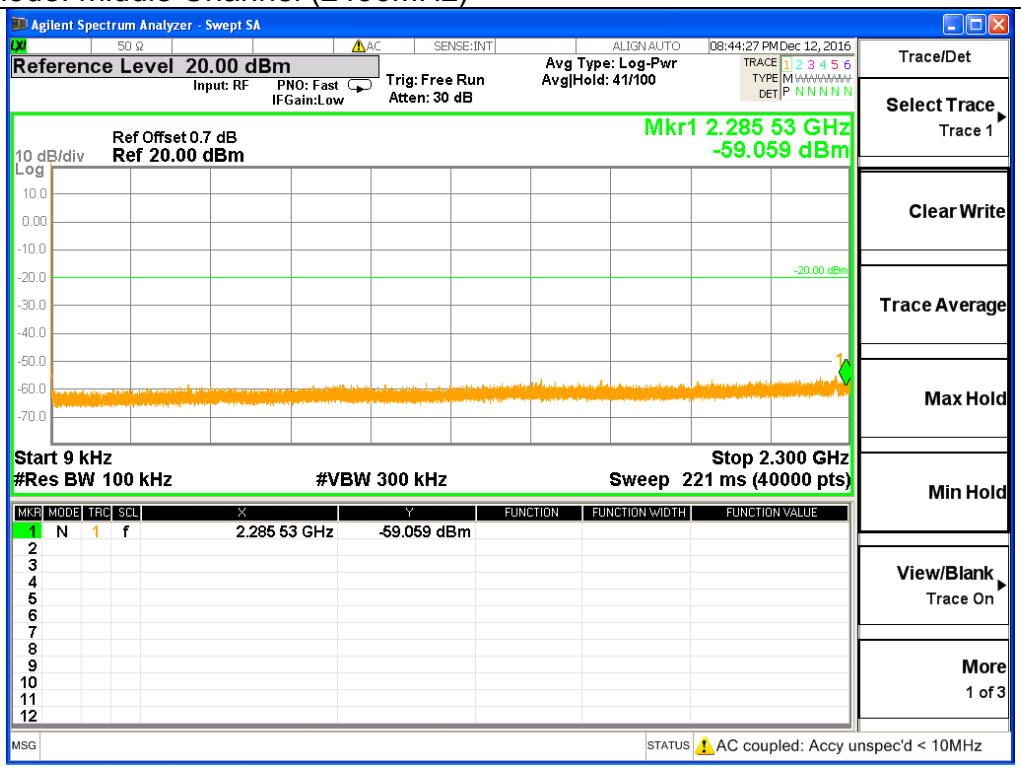
Test mode: lowest Channel (2412MHz)

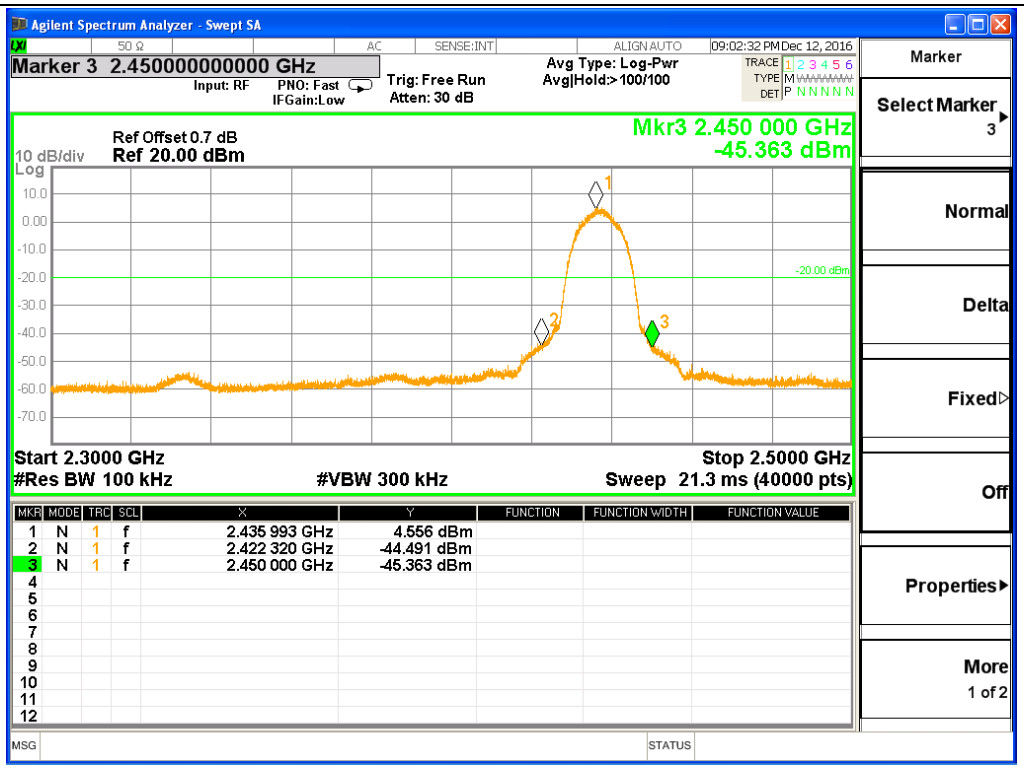


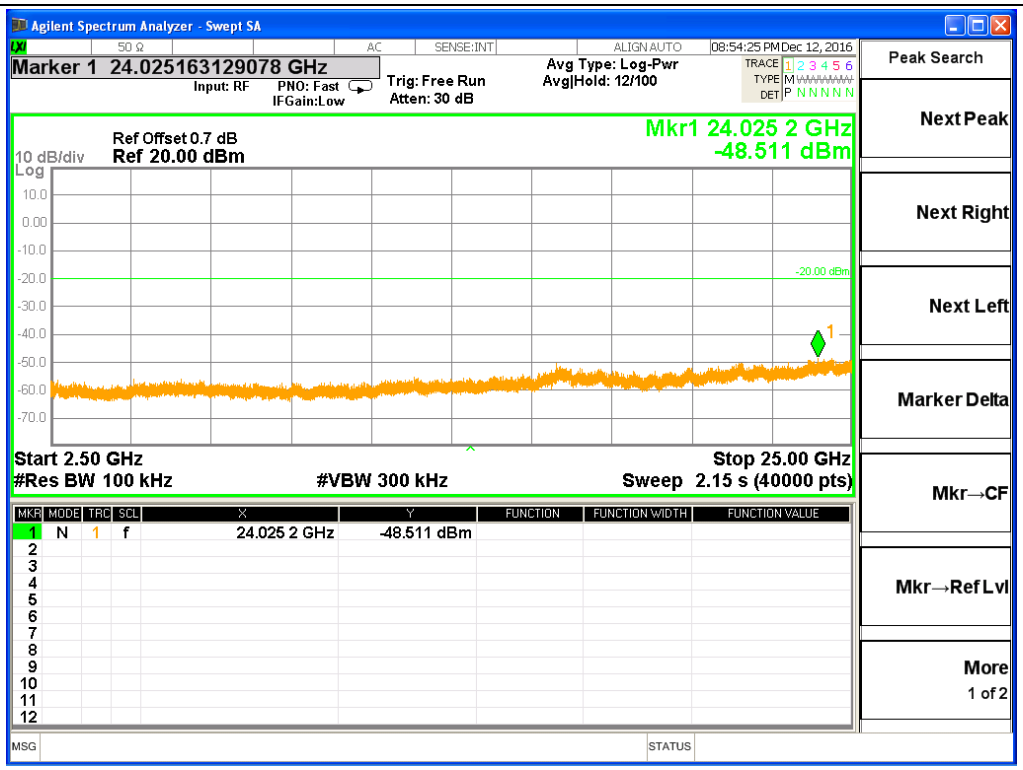

Agilent Spectrum Analyzer - Swept SA
Marker 3 2.426025150629 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:49:30 PM Dec 12, 2016
Ref Offset 0.7 dB
10 dB/div
Ref 20.00 dBm
Mkr3 2.426 025 GHz
-46.342 dBm
-20.00 dBm
Start 2.3000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.5000 GHz
Sweep 21.3 ms (40000 pts)
1 N 1 f 2.412 053 GHz 4.396 dBm
2 N 1 f 2.400 000 GHz -40.221 dBm
3 N 1 f 2.426 025 GHz -46.342 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 24.025163129078 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
08:54:25 PM Dec 12, 2016
Ref Offset 0.7 dB
10 dB/div
Ref 20.00 dBm
Mkr1 24.025 2 GHz
-48.511 dBm
-20.00 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.15 s (40000 pts)
1 N 1 f 24.025 2 GHz -48.511 dBm
Peak Search
Next Peak
Next Right
Next Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More 1 of 2

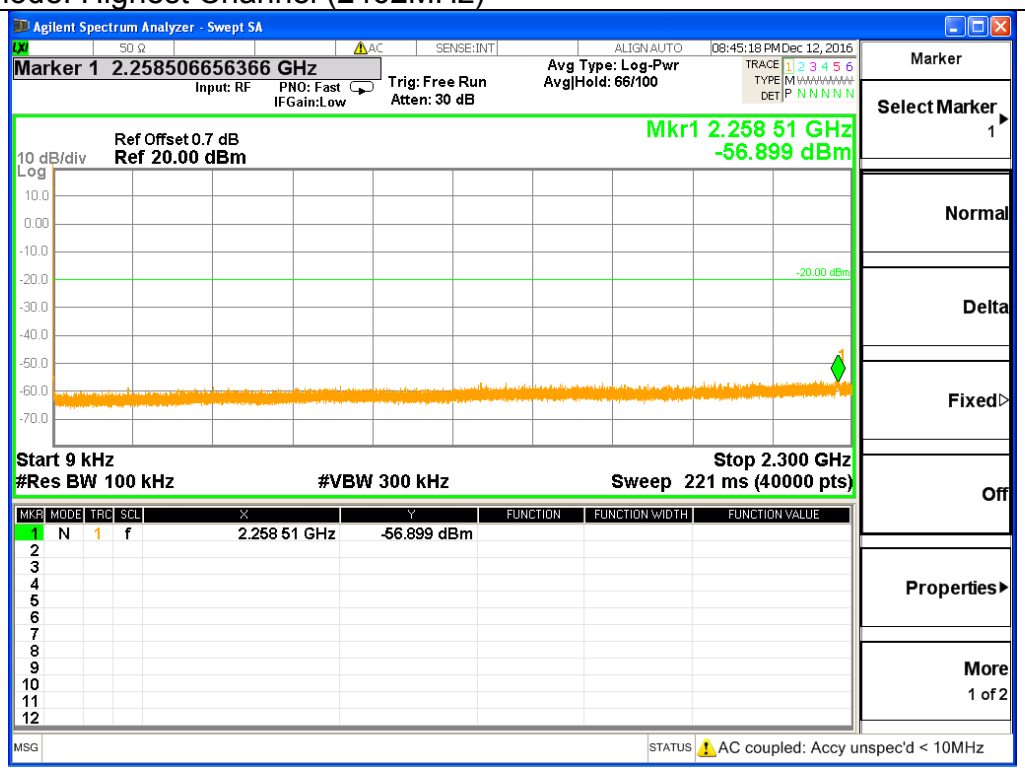
Test mode: middle Channel (2436MHz)

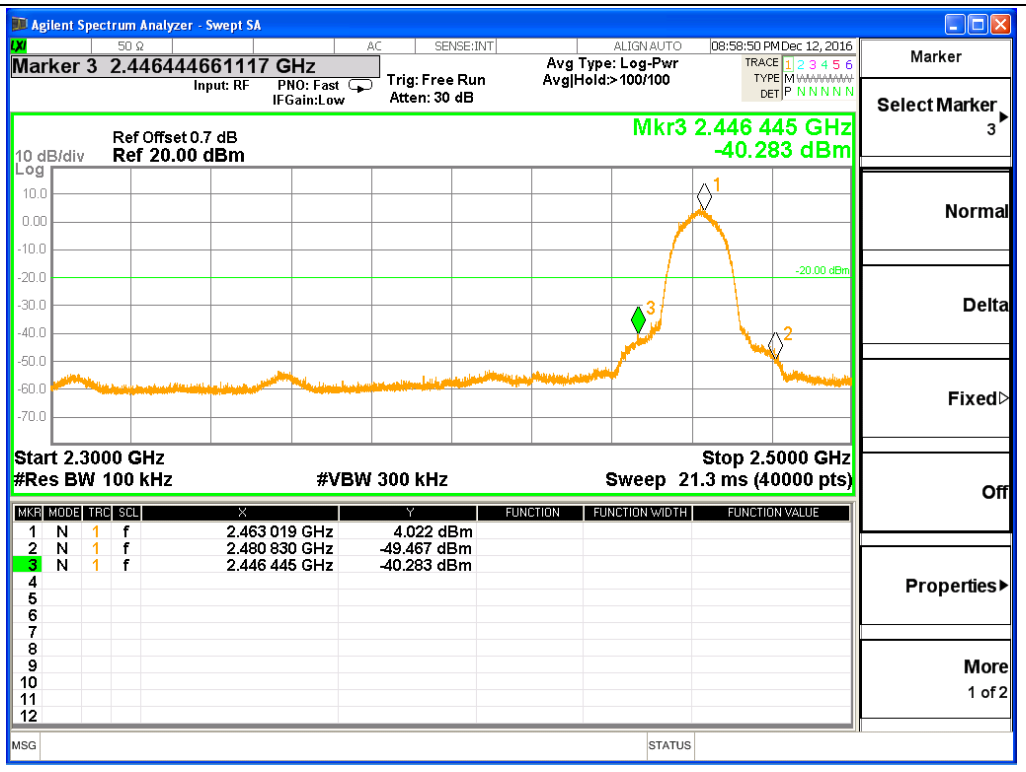


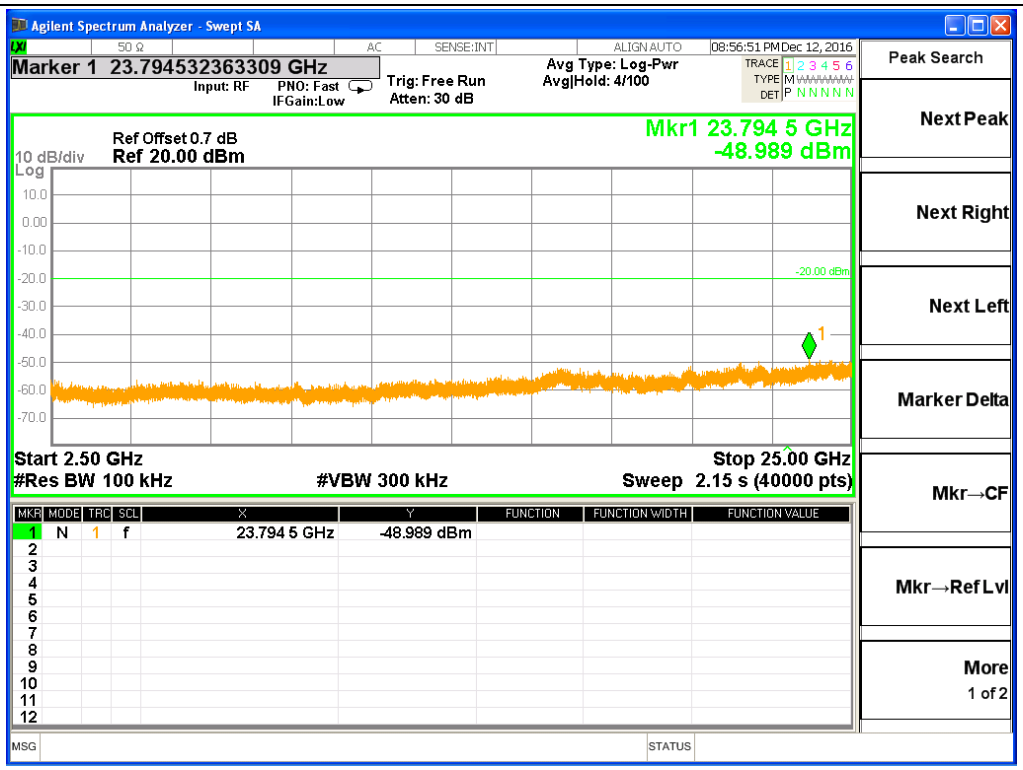



Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:54:25 PM Dec 12, 2016
Marker 1 24.025163129078 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.7 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 24.025 2 GHz
-48.511 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-20.00 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.15 s (40000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 24.025 2 GHz -48.511 dBm
2
3
4
5
6
7
8
9
10
11
12
MSG
STATUS
Peak Search
Next Peak
Next Right
Next Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Test mode: Highest Channel (2462MHz)






Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:56:51 PM Dec 12, 2016
Marker 1 23.794532363309 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 4/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.7 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 23.794 5 GHz
-48.989 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-20.00 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.15 s (40000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 23.794 5 GHz -48.989 dBm
2
3
4
5
6
7
8
9
10
11
12
MSG
STATUS
Peak Search
Next Peak
Next Right
Next Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

5.8 Antenna Application

5.8.1 Antenna Requirement

Standard	Requirement
FCC CFR Part 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. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Type	Frequency	Antenna Gain	Limit
FPCB Antenna	2.4GHz	-4.61dBi	≤6dBi

5.8.2 Result

PASS