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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT

OF

Video Doorbell

Model No.: LVD01，LVD0Y（Y=1~9 is defined for different silkscreen or color)

FCC ID: 2ABT4LVD01

Trademark: N/A

Report No.: ES190725016E1

Issue Date: August 09, 2019

Prepared for

Sky Light Imaging Limited
Room 1910, 19/F, Kwong Sang Hong Centre 151-153, Hoi Bun Road, Kwun Tong, Kowloon, Hong Kong

Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Sky Light Imaging Limited. Room 1910, 19/F, Kwong Sang Hong Centre 151-153, Hoi Bun Road, Kwun Tong, Kowloon, Hong Kong.
Manufacturer:	Sky Light Imaging Limited. Room 1910, 19/F, Kwong Sang Hong Centre 151-153, Hoi Bun Road, Kwun Tong, Kowloon, Hong Kong.
Factory 1:	Sky Light Electronic (ShenZhen) Limited No. 8 and 9 Building, AnTuoShan Industrial Area,ShaJing, BaoAn, Shenzhen, Guangdong China.
Factory 2:	Sky Light Electronic Join Stock Company Binh Xuyen IZ, Dao Duc Commune, Binh Xuyen District, Vinh Phuc Province, Viet Nam
Factory:	Sky Light Electronic (ShenZhen) Limited No. 8 and 9 Building, AnTuoShan Industrial Area,ShaJing, BaoAn, Shenzhen, Guangdong China.
Product Description:	Video Doorbell
Model Number:	LVD01，LVD0Y（Y=1~9 is defined for different silkscreen or color)

We hereby certify that:

The above equipment was tested by EMTEK(SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2017).

Date of Test : July 25, 2019 to August 08, 2019

Prepared by : 

Yaping Shen/Editor

Reviewer : 

Joe Xia/Supervisor

Approved & Authorized Signer : 

Lisa Wang/Manager

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	ES190725016E1

Table of Contents

1. General Information

1.1 Product Description

Characteristics	Description
Product Name	Video Doorbell
Model number	LVD01，LVD0Y（Y=1~9 is defined for different silkscreen or color)
Power Supply	Battery 3.8V
Modulation	802.11b: DSSS(DBPSK/DQPSK/CCK) 802.11g/n: OFDM(BPSK/QPSK/16QAM/64QAM)
Operating Frequency Range	2412-2462MHz for 802.11b/g/n(HT20)
Number of Channels	11 for 20MHz bandwidth;
Transmit Power Max	802.11b: 18.23dBm 802.11g: 14.65dBm 802.11n(HT20): 13.55dBm
Antenna Type	Internal Metal antenna
Antenna Gain	2.5dBi

Note: *for more details, please refer to the User's manual of the EUT.*

2. System Test Configuration

2.1 EUT Configuration

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

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. Emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

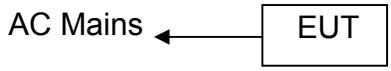


Table 2-1 Equipment Used in Tested System

Item	Equipment	Trademark	Model No.	FCC ID	Note
1.	Video Doorbell	N/A	LVD01	2ABT4LVD01	EUT

Note:

(1) Unless otherwise denoted as EUT in『Remark』column, device(s) used in tested system is a support equipment.

3. Description of Test Modes

The EUT has been tested under its typical operating condition.
The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n (HT20): MCS0; were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for 802.11 b/g/n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447		

Test Frequency and Channel for 802.11 b/g/n (HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	6	2437	11	2462

4. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.247(a)(2)	6dB bandwidth	Pass
§15.247(b)(3)	Max Peak output Power test	Pass
§15.247(e)	Power density	Pass
§15.247(d)	Band edge test	Pass
§15.207	AC Power Conducted Emission	N/A
§15.247(d), §15.209	Radiated Emission	Pass
§15.247(d)	Antenna Port Emission	Pass
§15.247(b)&§15.203	Antenna Application	Pass

5. Test Facility

Site Description

EMC Lab : Accredited by CNAS, 2016.10.24
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)
The Certificate Registration Number is L2291.

Accredited by TUV Rheinland Shenzhen 2016.5.19
The Laboratory has been assessed according to the requirements ISO/IEC 17025.

Accredited by FCC, August 03, 2017
Designation Number: CN1204
Test Firm Registration Number: 882943

Accredited by Industry Canada, November 24, 2015
The Certificate Registration Number is 4480A.

Accredited by A2LA, July 31, 2017
The Certificate Number is 4321.01.

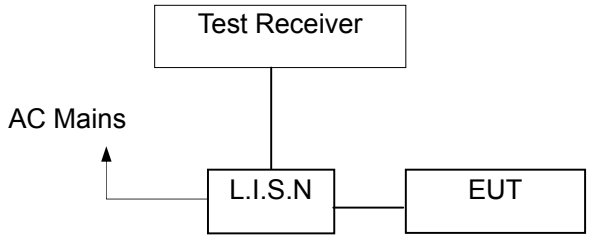
Name of Firm : EMTEK(SHENZHEN) CO., LTD.
Site Location : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China.

6. Conducted Emissions Test

6.1 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**Last Cal.**	**Due date**
Test Receiver	Rohde & Schwarz	ESCS30	100018	05/23/2019	05/22/2020
L.I.S.N	Rohde & Schwarz	ENV216	100017	05/23/2019	05/22/2020
RF Switching Unit	CDS	RSU-M2	38401	05/23/2019	05/22/2020
Coaxial Cable	CDS	79254	46107086	05/23/2019	05/22/2020

6.4 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	**Quasi-peak**	**Average**
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.5 Measurement Result

N/A

Note:Charging mode WIFI does not work

7. Radiated Emission Test

7.1 Measurement Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

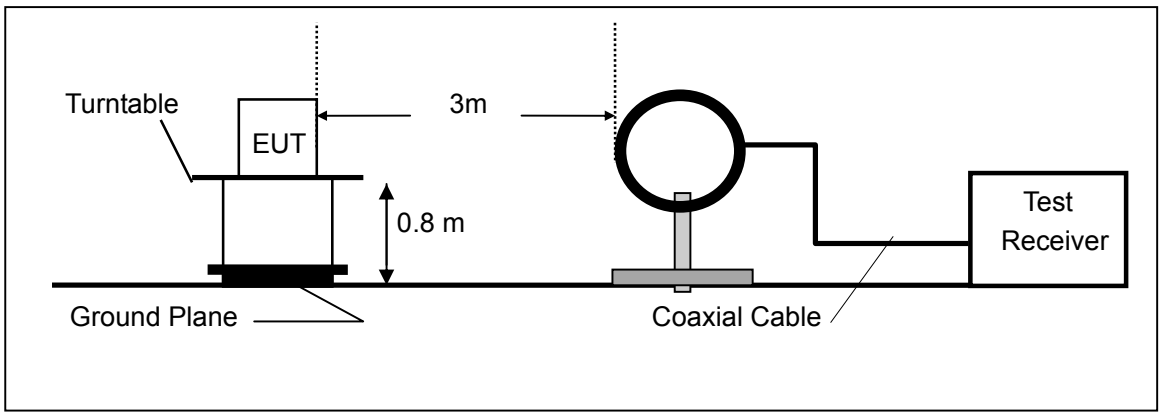
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

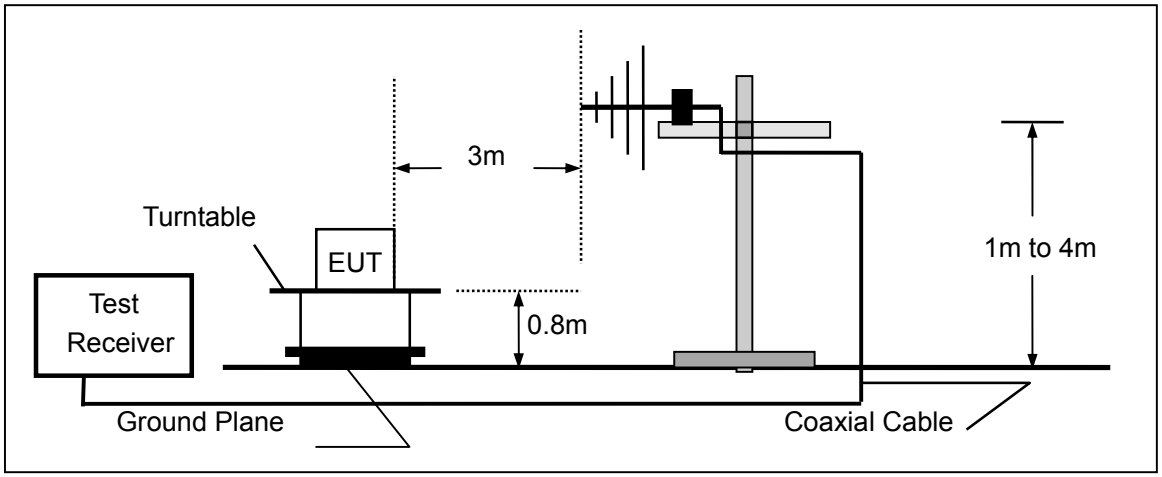
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	AVG
Trace	Max hold

7.2 Test SET-UP (Block Diagram of Configuration)

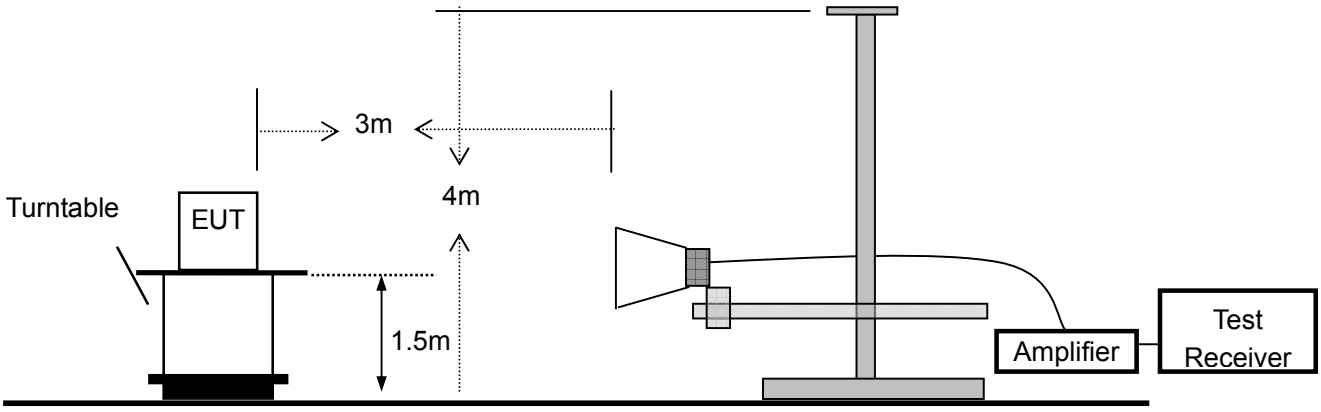
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



7.3 Measurement Equipment Used

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	1166.5950.03	05/23/2019	1 Year
2.	Bilog Antenna	Schwarzbeck	VULB9163	000141	05/23/2019	1 Year
3.	Power Amplifier	CDS	RSU-M352	818	05/23/2019	1 Year
4.	Power Amplifier	HP	8447F	OPT H64	05/23/2019	1 Year
5.	Color Monitor	SUNSPO	SP-140A	N/A	05/23/2019	1 Year
6.	Single Line Filter	JIANLI	XL-3	N/A	05/23/2019	1 Year
7.	Single Phase Power Line Filter	JIANLI	DL-2X100B	N/A	05/23/2019	1 Year
8.	3 Phase Power Line Filter	JIANLI	DL-4X100B	N/A	05/23/2019	1 Year
9.	DC Power Filter	JIANLI	DL-2X50B	N/A	05/23/2019	1 Year
10.	Cable	Schwarzbeck	PLF-100	549489	05/23/2019	1 Year
11.	Cable	Rosenberger	CIL02	A0783566	05/23/2019	1 Year
12.	Cable	Rosenberger	RG 233/U	525178	05/23/2019	1 Year
13.	Signal Analyzer	Rohde & Schwarz	FSV30	103040	05/23/2019	1 Year
14.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1272	05/23/2019	1 Year
15.	Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	05/23/2019	1 Year
16.	Cable	H+S	CBL-26	N/A	05/23/2019	1 Year
17.	Cable	H+S	CBL-26	N/A	05/23/2019	1 Year
18.	Cable	H+S	CBL-26	N/A	05/23/2019	1 Year

7.4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

Frequencies (MHz)	Field Strength (micorvolts/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

15.205 Restricted bands of operation

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	2690 - 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])

Remark : 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

7.5 Measurement Result

Below 30MHz:

All the modulation modes were tested the data of the test mode are recorded in the following pages.

Operation Mode:	TX Mode	Test Date :	August 07, 2019
Frequency Range:	9KHz~30MHz	Temperature :	28℃
Test Result:	PASS	Humidity :	60 %
Measured Distance:	3m	Test By:	WOLF

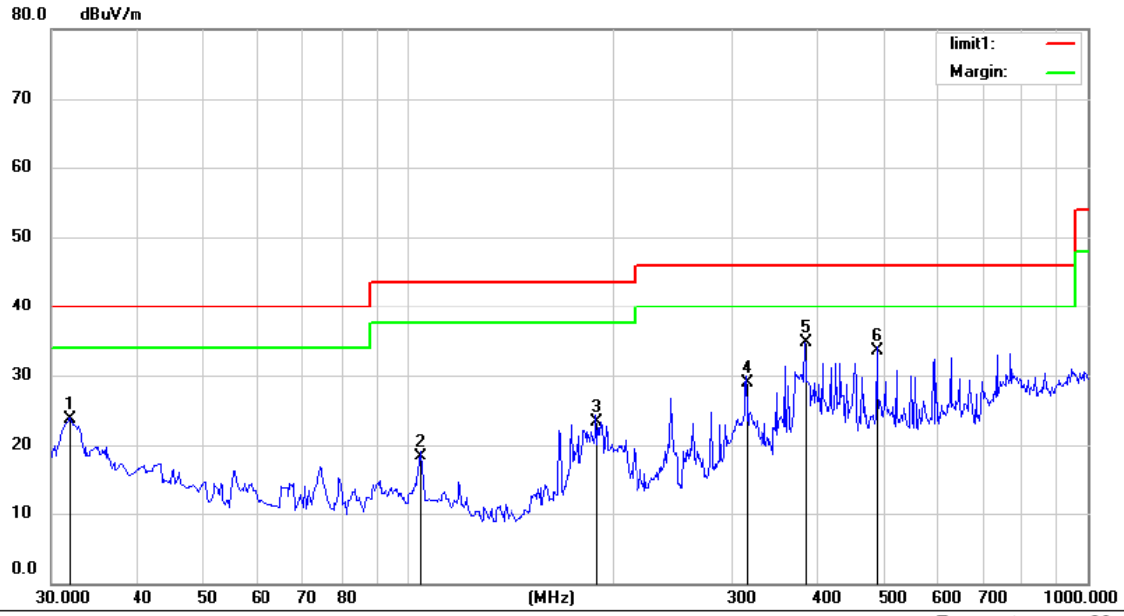
Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Below 1000MHz:

All the modulation modes were tested the data of the worst mode (TX 802.11b 2462MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following test plots:



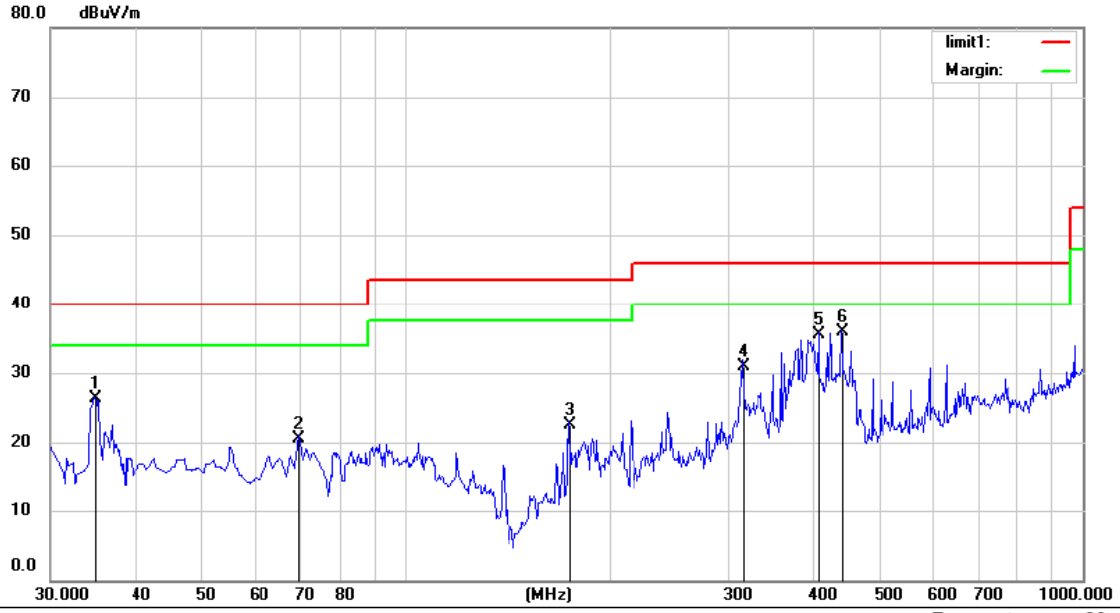
Site Chamber #1 Polarization: ***Horizontal*** Temperature: 26

Limit: (RE)FCC PART 15 B 3m Power: Battery Humidity: 55 %

Mode: TX2462

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		31.9400	42.62	-19.00	23.62	40.00	-16.38	QP			
2		104.6900	36.59	-18.19	18.40	43.50	-25.10	QP			
3		189.0800	41.56	-18.33	23.23	43.50	-20.27	QP			
4		315.1800	42.56	-13.58	28.98	46.00	-17.02	QP			
5	*	385.0200	45.89	-11.27	34.62	46.00	-11.38	QP			
6		489.7800	42.67	-9.22	33.45	46.00	-12.55	QP			



Site Chamber #1 Polarization: *Vertical* Temperature: 26

Limit: (RE)FCC PART 15 B 3m Power: Battery Humidity: 55 %

Mode: TX2462

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		34.8500	44.86	-18.63	26.23	40.00	-13.77	QP			
2		69.7700	40.10	-19.54	20.56	40.00	-19.44	QP			
3		174.5300	42.56	-20.01	22.55	43.50	-20.95	QP			
4		315.1800	44.57	-13.58	30.99	46.00	-15.01	QP			
5		408.3000	46.32	-10.85	35.47	46.00	-10.53	QP			
6	*	441.2800	46.08	-10.12	35.96	46.00	-10.04	QP			

Above 1GHz:

All the modulation modes were tested the data of the worst mode (TX 802.11b) are recorded in the following pages.

Operation Mode: 802.11b Lowest Test Date : August 07, 2019
Test Voltage: AC 120V/60Hz Test by: Andy

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4824	V	62.16	43.62	74	54	-11.84	-10.38
7236	V	63.52	42.18	74	54	-10.48	-11.82
9648	V	62.34	41.56	74	54	-11.66	-12.44
12060	V	61.14	40.59	74	54	-12.86	-13.41
14472	V	60.23	40.32	74	54	-13.77	-13.68
16884	V	59.36	39.62	74	54	-14.64	-14.38
4824	H	64.57	43.26	74	54	-9.43	-10.74
7236	H	63.33	43.19	74	54	-10.67	-10.81
9648	H	63.19	42.57	74	54	-10.81	-11.43
12060	H	62.18	41.59	74	54	-11.82	-12.41
14472	H	60.42	40.37	74	54	-13.58	-13.63
16884	H	60.37	40.15	74	54	-13.63	-13.85

Operation Mode: 802.11b Middle Test Date : August 07, 2019
Test Voltage: AC 120V/60Hz Test by: Andy

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4824	V	63.16	42.57	74	54	-10.84	-11.43
7236	V	62.58	41.33	74	54	-11.42	-12.67
9648	V	60.24	41.67	74	54	-13.76	-12.33
12060	V	59.68	39.62	74	54	-14.32	-14.38
14472	V	59.34	39.13	74	54	-14.66	-14.87
16884	V	57.03	37.58	74	54	-16.97	-16.42
4824	H	62.13	41.15	74	54	-11.87	-12.85
7236	H	60.59	40.25	74	54	-13.41	-13.75
9648	H	60.34	40.13	74	54	-13.66	-13.87
12060	H	59.61	39.62	74	54	-14.39	-14.38
14472	H	58.34	37.56	74	54	-15.66	-16.44
16884	H	57.34	36.11	74	54	-16.66	-17.89

Operation Mode: 802.11b Highest
Test Voltage: AC 120V/60Hz
Test Date : August 07, 2019
Test by: Andy

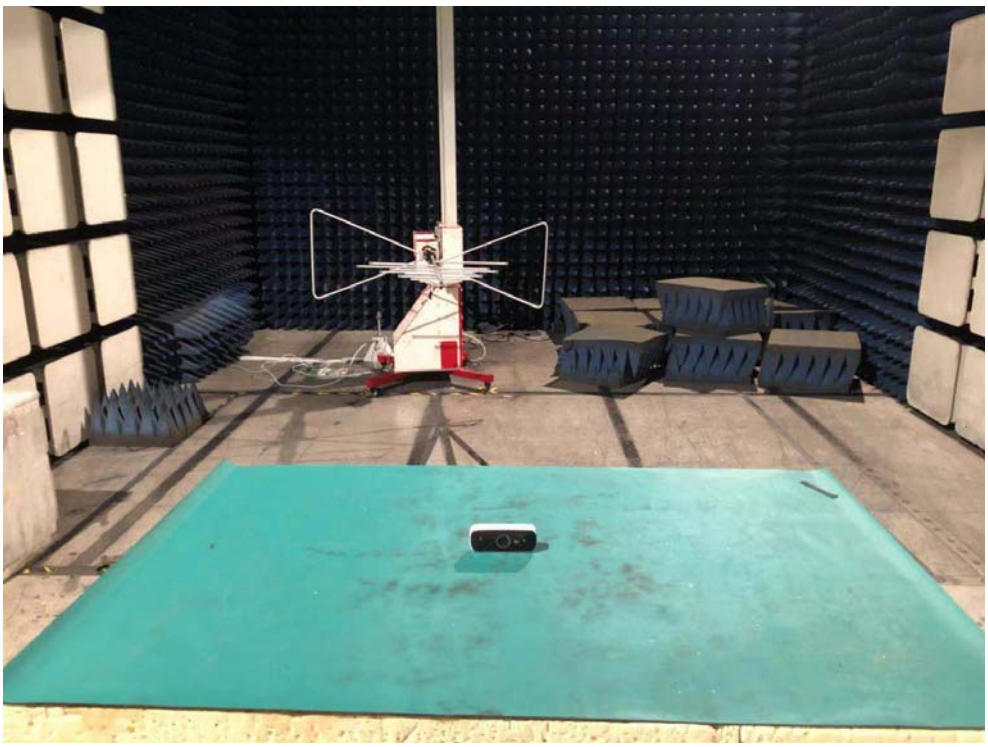
Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4824	V	61.42	42.13	74	54	-12.58	-11.87
7236	V	60.2	40.25	74	54	-13.8	-13.75
9648	V	59.35	39.62	74	54	-14.65	-14.38
12060	V	58.64	39.48	74	54	-15.36	-14.52
14472	V	57.25	38.51	74	54	-16.75	-15.49
16884	V	56.24	37.16	74	54	-17.76	-16.84
4824	H	60.48	40.15	74	54	-13.52	-13.85
7236	H	59.58	39.69	74	54	-14.42	-14.31
9648	H	58.67	38.64	74	54	-15.33	-15.36
12060	H	57.64	37.74	74	54	-16.36	-16.26
14472	H	56.69	37.49	74	54	-17.31	-16.51
16884	H	54.17	35.24	74	54	-19.83	-18.76

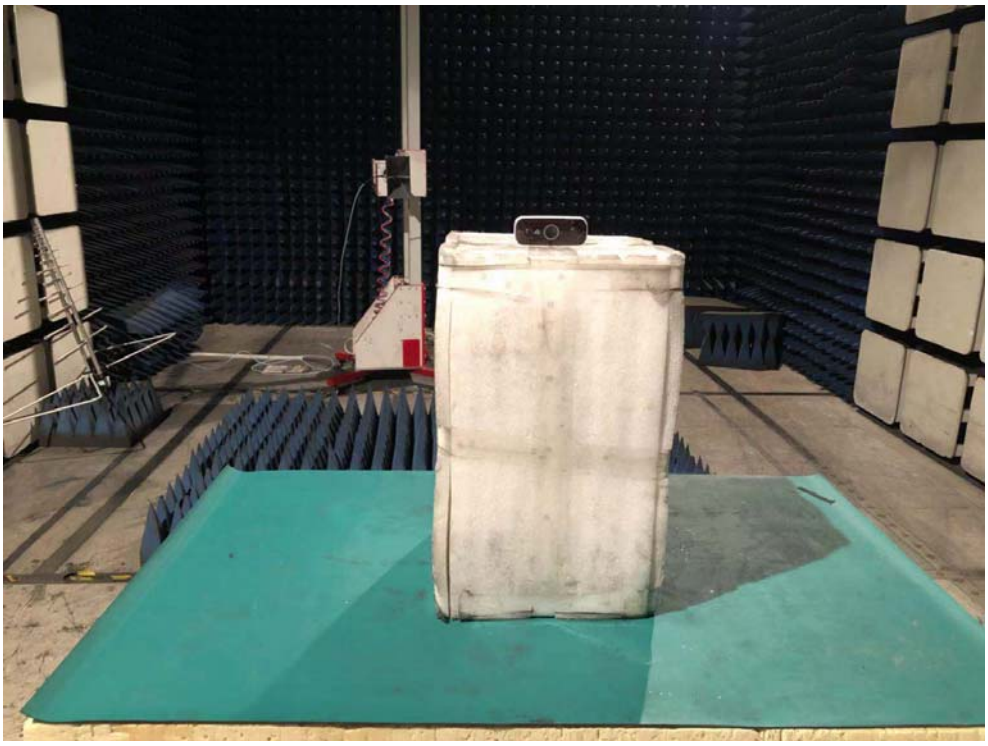
All emissions not reported were more than 20dB below the specified limit or in the noise floor.

No others harmonics emissions are higher than 20 dB below the limits of 47 CFR Part 15.247.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown " – " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

7.6 Radiated Measurement Photos:





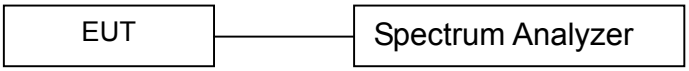
8. 6dB Bandwidth Test

8.1 Measurement Procedure

The EUT was operating in IEEE 802.11b, 802.11g, 802.11n(HT20) mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

1. Set resolution bandwidth (RBW) = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequency) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	FSV30	1321.3008K	05/23/2019	05/22/2020

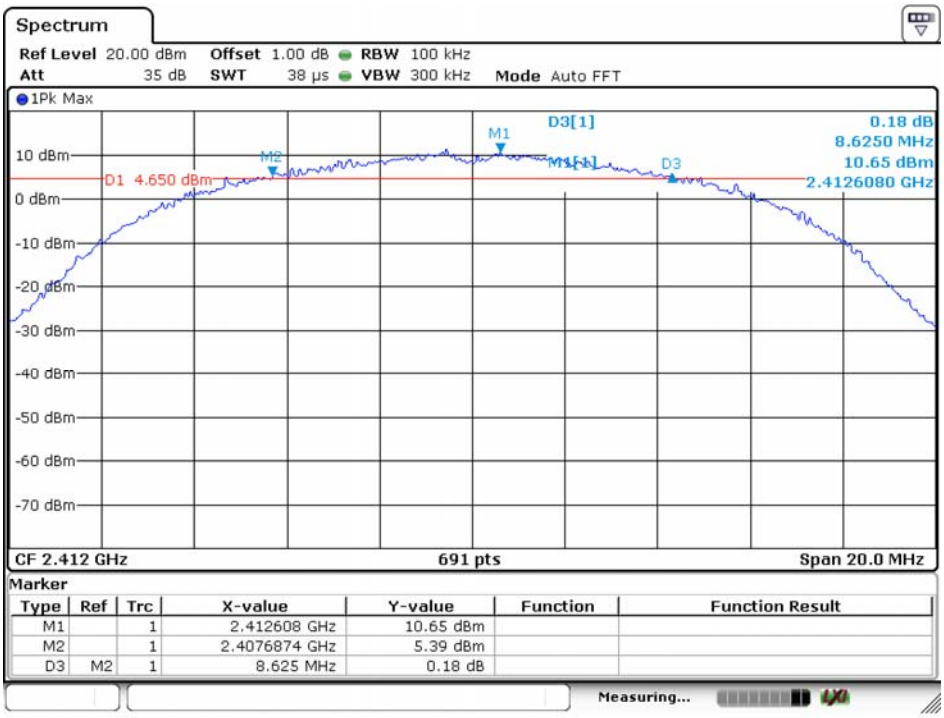
8.4 Measurement Results

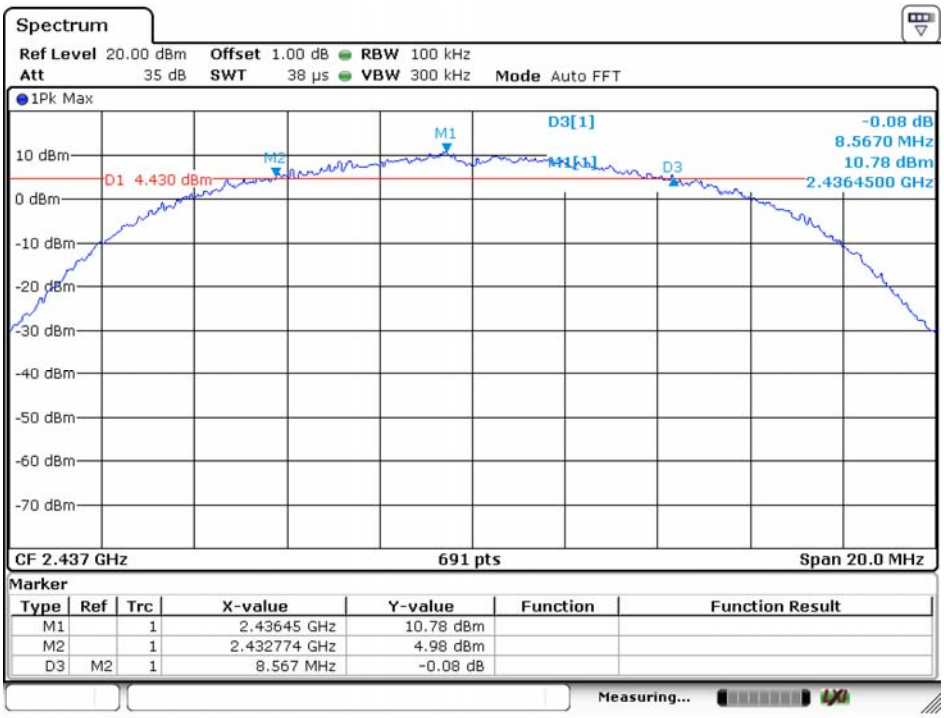
6 Bandwidth Test Data Chart:

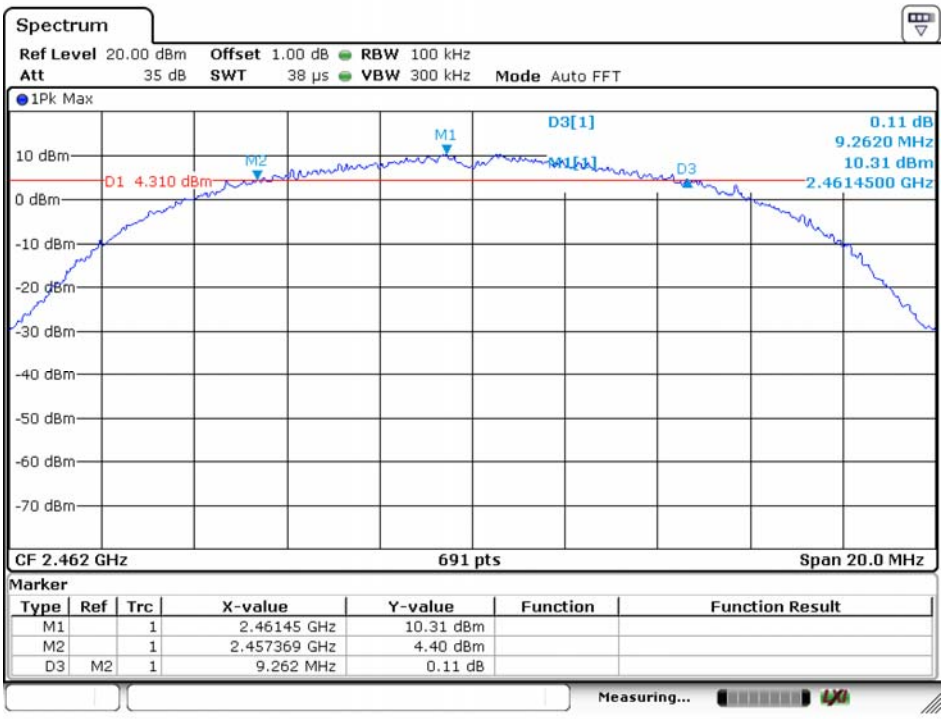
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 07, 2019
Test By:	Andy	Temperature :	28℃
Humidity :	60%		

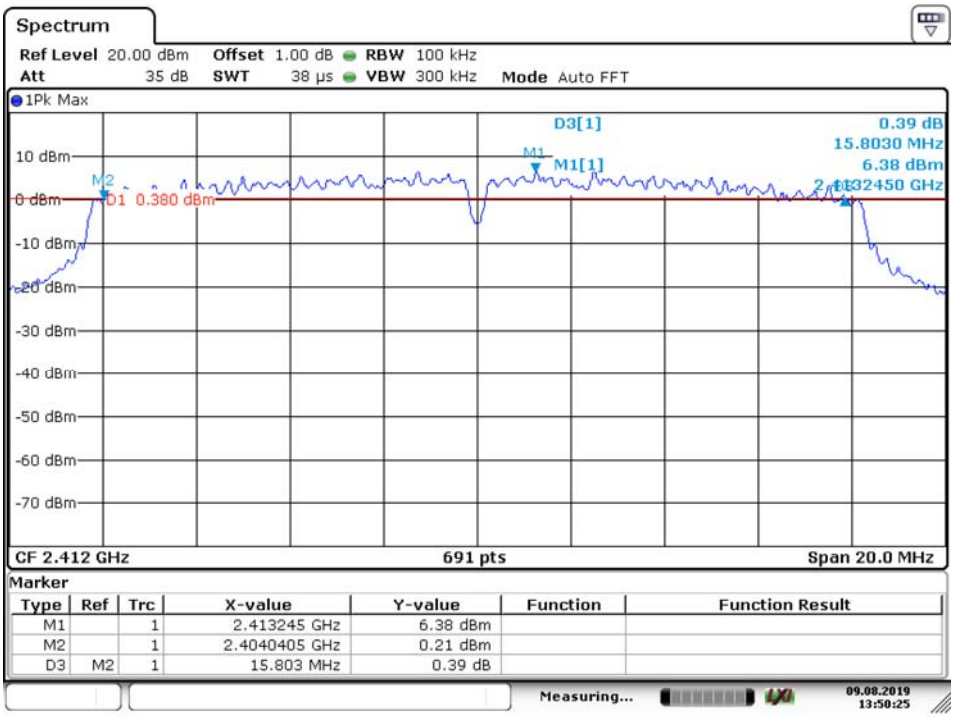
IEEE 802.11b			
Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)	Result
2412	8625	>500	Pass
2437	8567	>500	
2462	9262	>500	

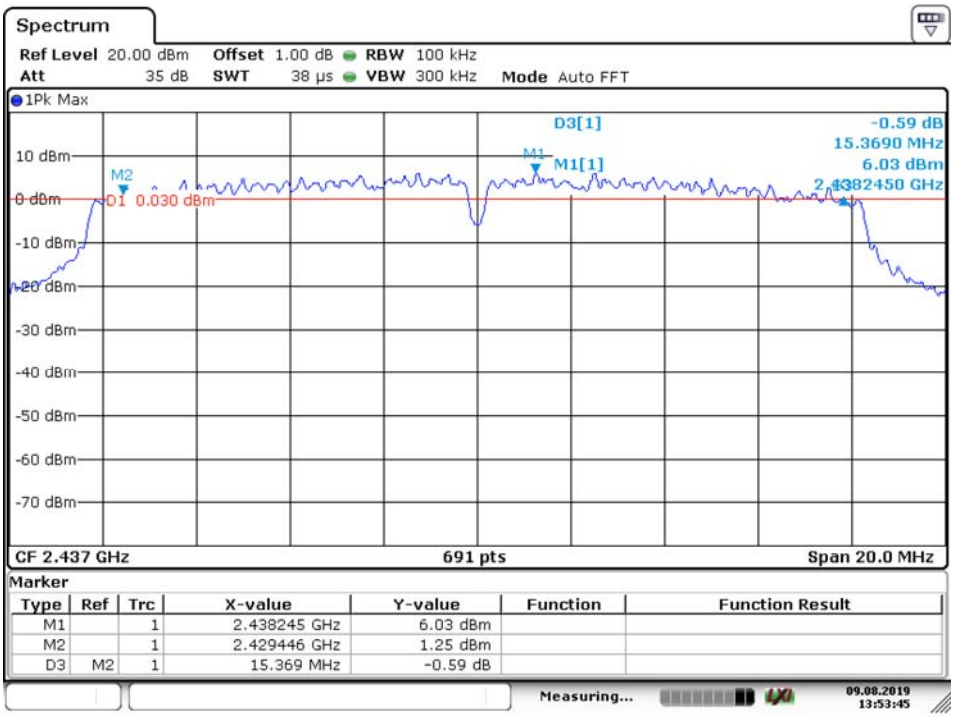


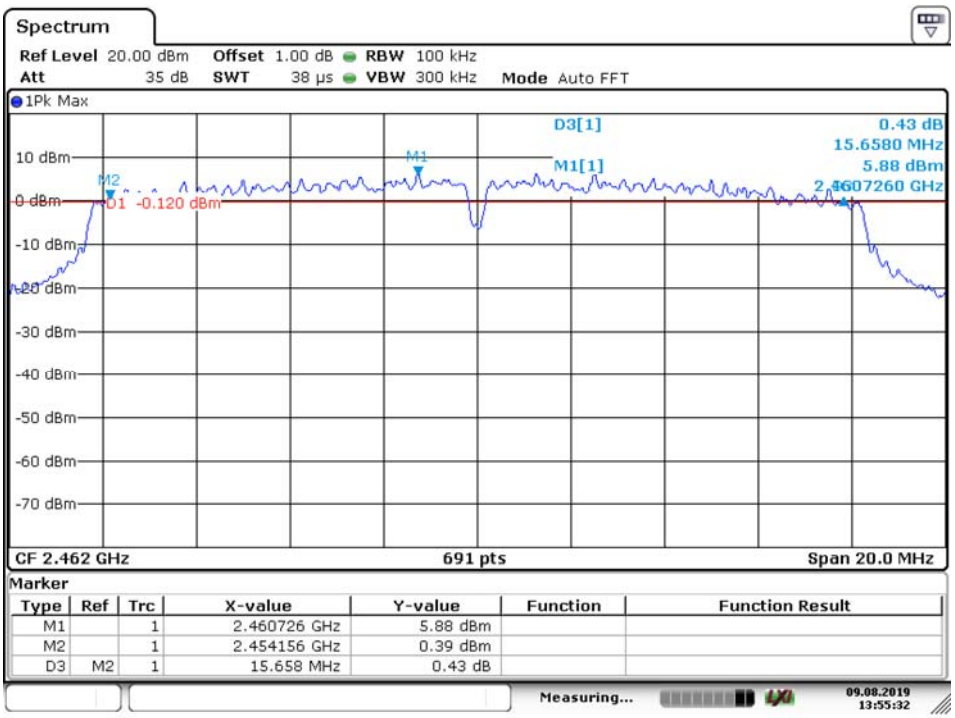

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 38 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D3[1] -0.08 dB
8.5670 MHz
10.78 dBm
2.4364500 GHz
D1 4.430 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 20.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.43645 GHz 10.78 dBm
M2 1 2.432774 GHz 4.98 dBm
D3 M2 1 8.567 MHz -0.08 dB
Measuring...


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 38 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D3[1] 0.11 dB
9.2620 MHz
10.31 dBm
2.4614500 GHz
D1 4.310 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 20.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.46145 GHz 10.31 dBm
M2 1 2.457369 GHz 4.40 dBm
D3 M2 1 9.262 MHz 0.11 dB
Measuring...

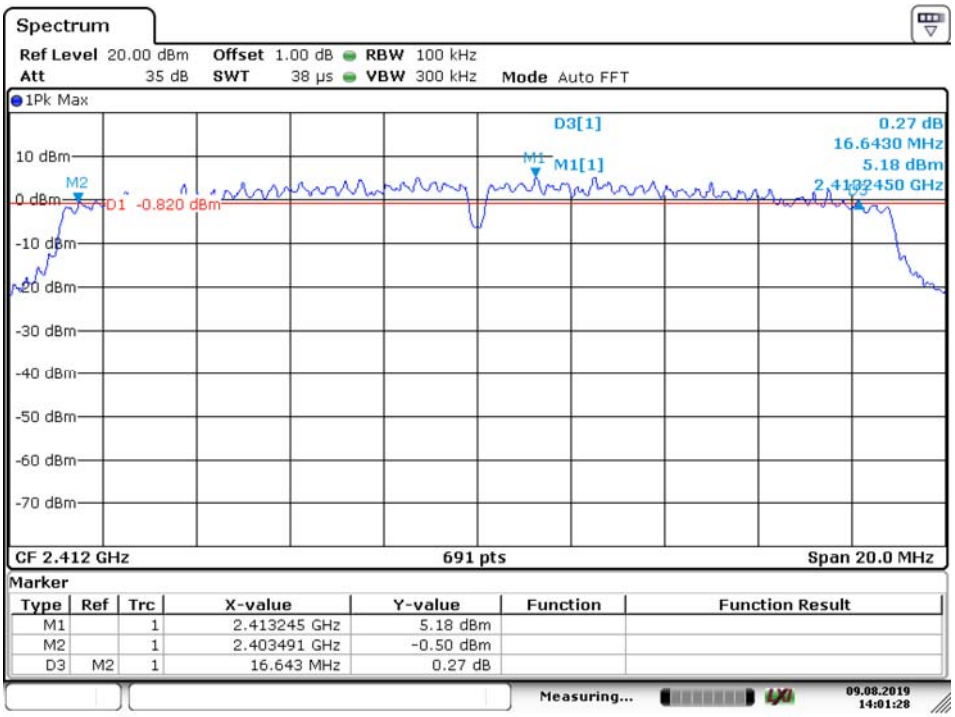
IEEE 802.11g			
Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)	Result
2412	15803	>500	Pass
2437	15369	>500	
2462	15658	>500	

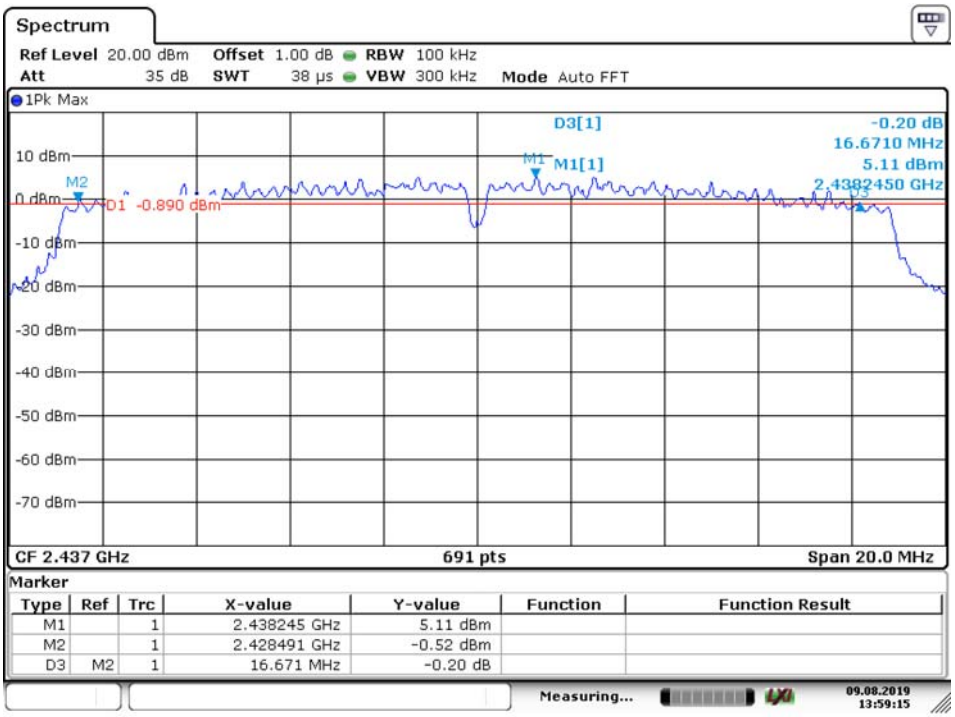


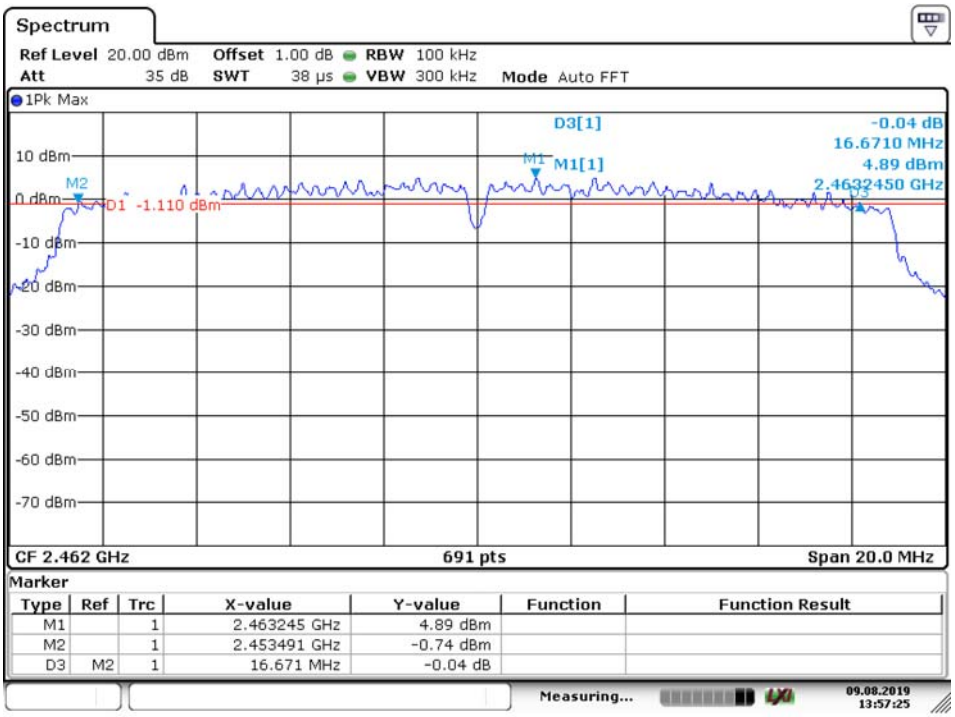

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 38 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D3[1] -0.59 dB
15.3690 MHz
M1[1] 6.03 dBm
2.438245 GHz
D1 0.030 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 20.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.438245 GHz 6.03 dBm
M2 1 2.429446 GHz 1.25 dBm
D3 M2 1 15.369 MHz -0.59 dB
Measuring...
09.08.2019
13:53:45


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 38 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D3[1] 0.43 dB
15.6580 MHz
M1[1] 5.88 dBm
2.460726 GHz
D1 -0.120 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 20.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.460726 GHz 5.88 dBm
M2 1 2.454156 GHz 0.39 dBm
D3 M2 1 15.658 MHz 0.43 dB
Measuring...
09.08.2019
13:55:32

IEEE 802.11n(HT20)			
Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)	Result
2412	16643	>500	Pass
2437	16671	>500	
2462	16671	>500	





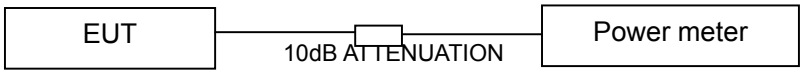

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 38 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D3[1]
-0.04 dB
16.6710 MHz
M1[1]
4.89 dBm
2.4632450 GHz
M2
D1 -1.110 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 20.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.463245 GHz 4.89 dBm
M2 1 2.453491 GHz -0.74 dBm
D3 M2 1 16.671 MHz -0.04 dB
Measuring...
09.08.2019
13:57:25

9. Maximum Peak Output Power Test

9.1 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04.
2. The RF output of EUT was connected to the power meter 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. Measure the conducted output power and record the results in the test report.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used

EQUIPMENT TYPE	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power meter	ML2495A	0824006	05/23/2019	05/22/2020
Power sensor	MA2411B	0738172	05/23/2019	05/22/2020

9.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

9.5 Measurement Results

Spectrum Detector:	PK	Test Date :	August 07, 2019
Test By:	Andy	Temperature :	28℃
Test Result:	PASS	Humidity :	60%

Test Channel	Average Output Power (dBm)				Limit(dBm)	Result
	802.11b	802.11g	802.11n(HT20)			
Lowest	18.23	14.65	13.54		30	Pass
Middle	18.20	14.64	13.55			
Highest	18.21	14.60	13.44			

10. Band Edge Test

10.1 Measurement Procedure

For Conducted Test

1. The testing follows FCC KDB Publication No. 558074 D01 DTS D01 Meas. Guidance v04.
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, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

For Radiated emission Test

1. The testing follows FCC KDB Publication No. 558074 D01 DTS D01 Meas. Guidance v04.
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 with 0.8 meter above ground.
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. Repeat above procedures until all frequency measured were complete.

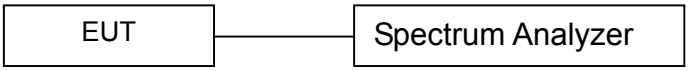
When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	AVG
Trace	Max hold

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used

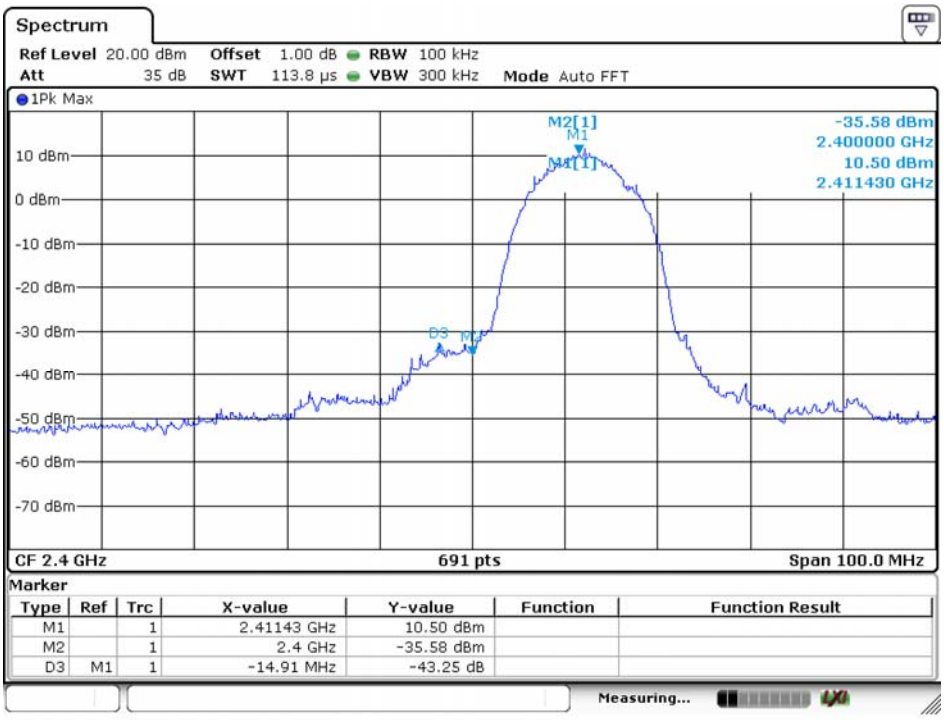
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	FSV30	1321.3008K	05/23/2019	05/22/2020

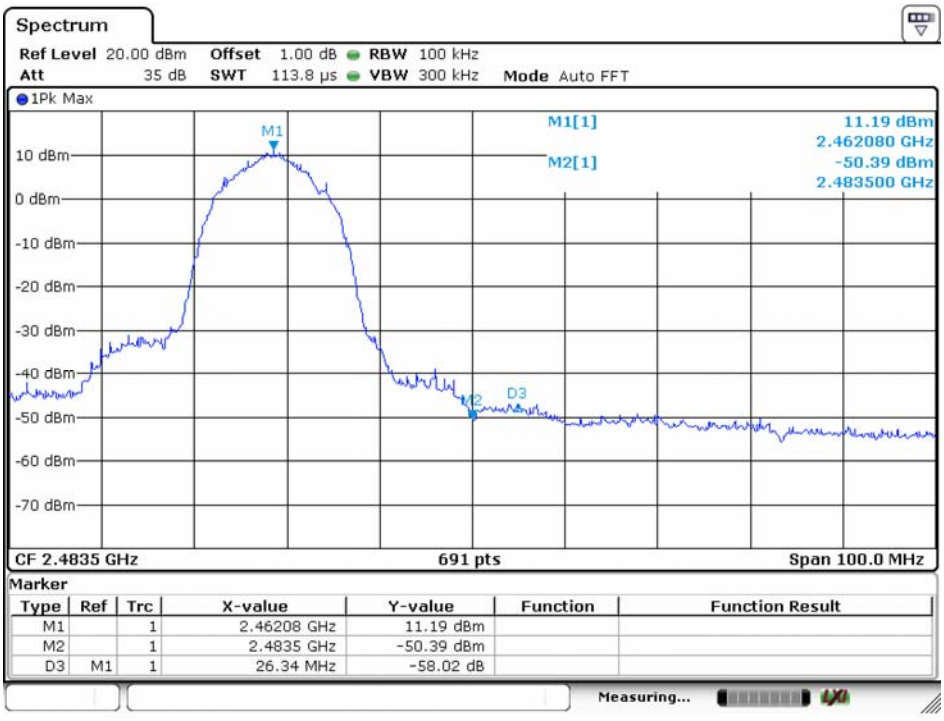
10.4 Measurement Results

1. Conducted Test

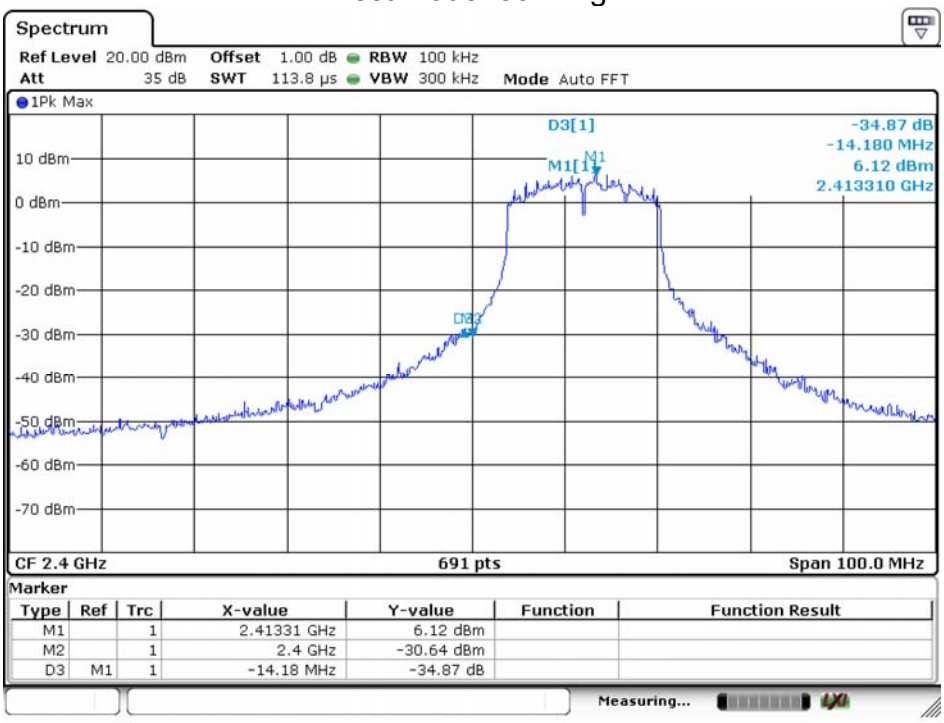
Please refer to the following pages.

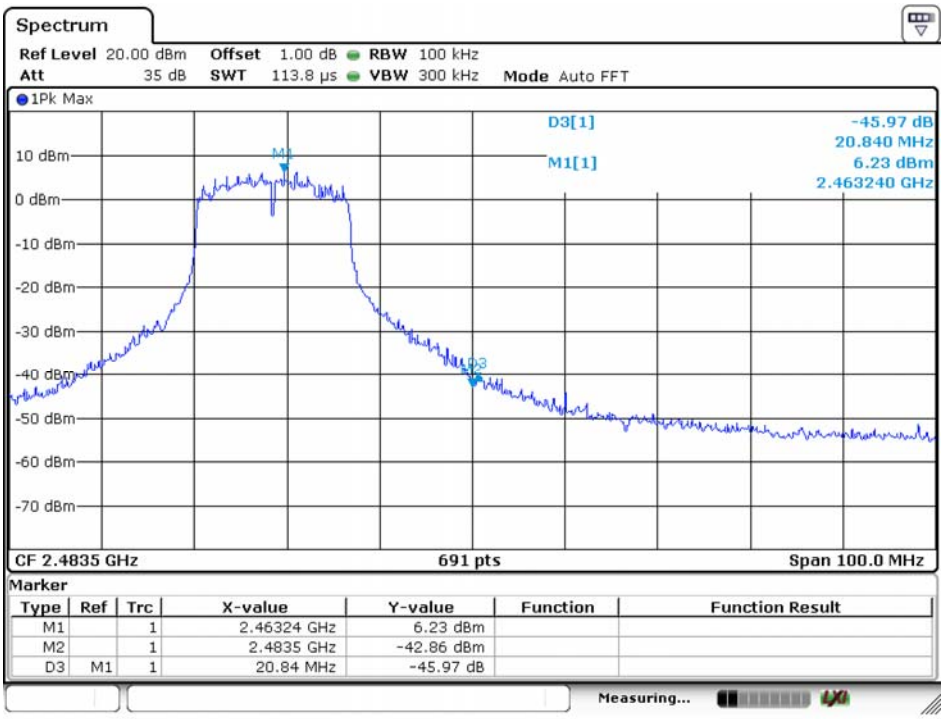
Test mode: 802.11b



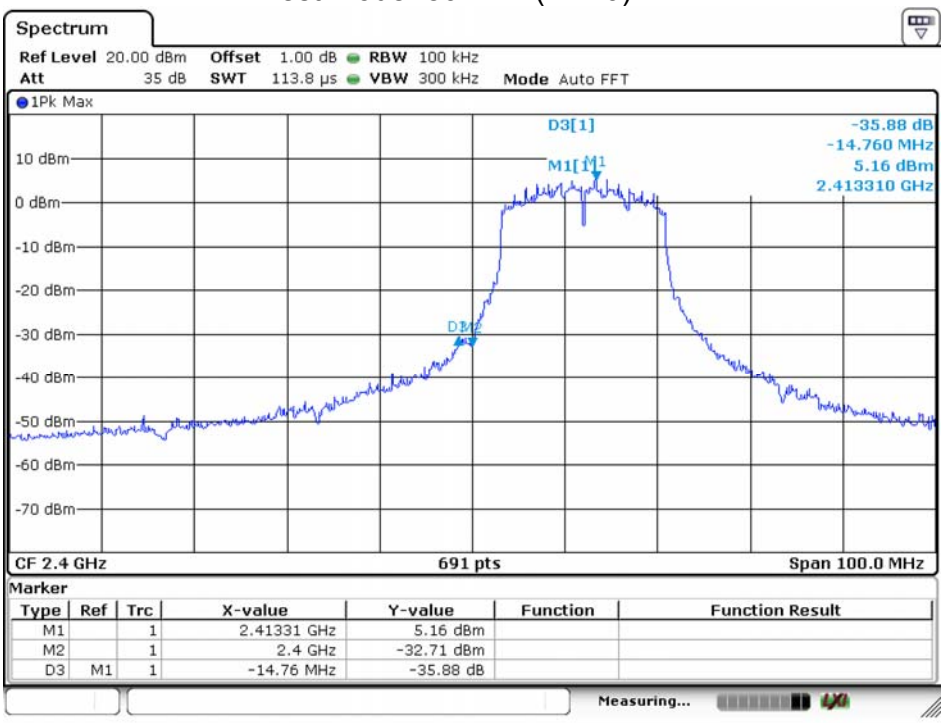


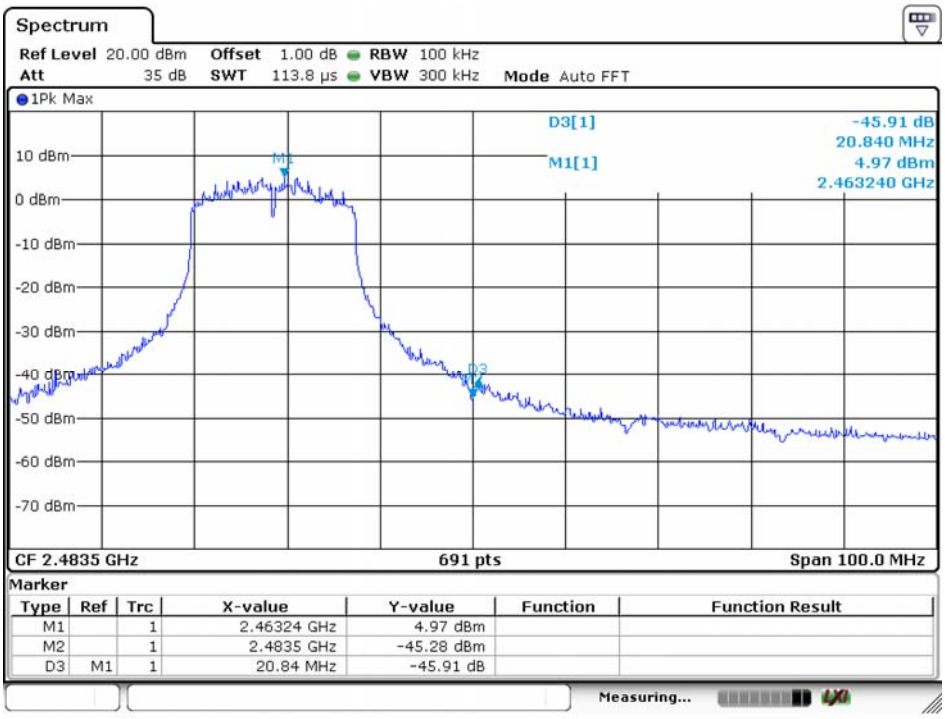
Test mode: 802.11g





Test mode: 802.11n(HT20)





2. Radiated emission Test

All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11n recorded was report as below:

Temperature :	25℃	Test Date :	August 07, 2019
Humidity :	59 %	Test By:	King Kong
Test mode:	802.11n	Frequency:	Channel 1: 2412MHz

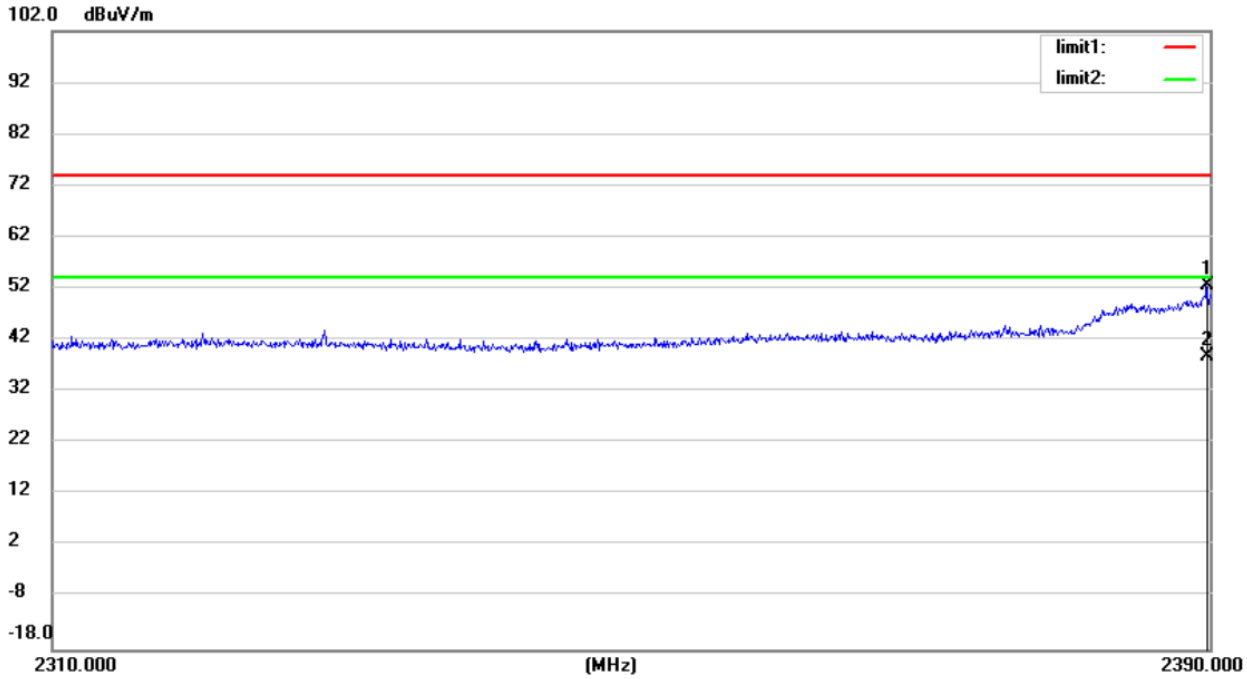
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2388.560	H	57.20	74.00	-16.80	39.41	54.00	-14.59
2384.080	V	49.85	74.00	-24.15	38.59	54.00	-15.41

Temperature :	25℃	Test Date :	August 07, 2019
Humidity :	59 %	Test By:	King Kong
Test mode:	802.11n	Frequency:	Channel 11: 2462MHz

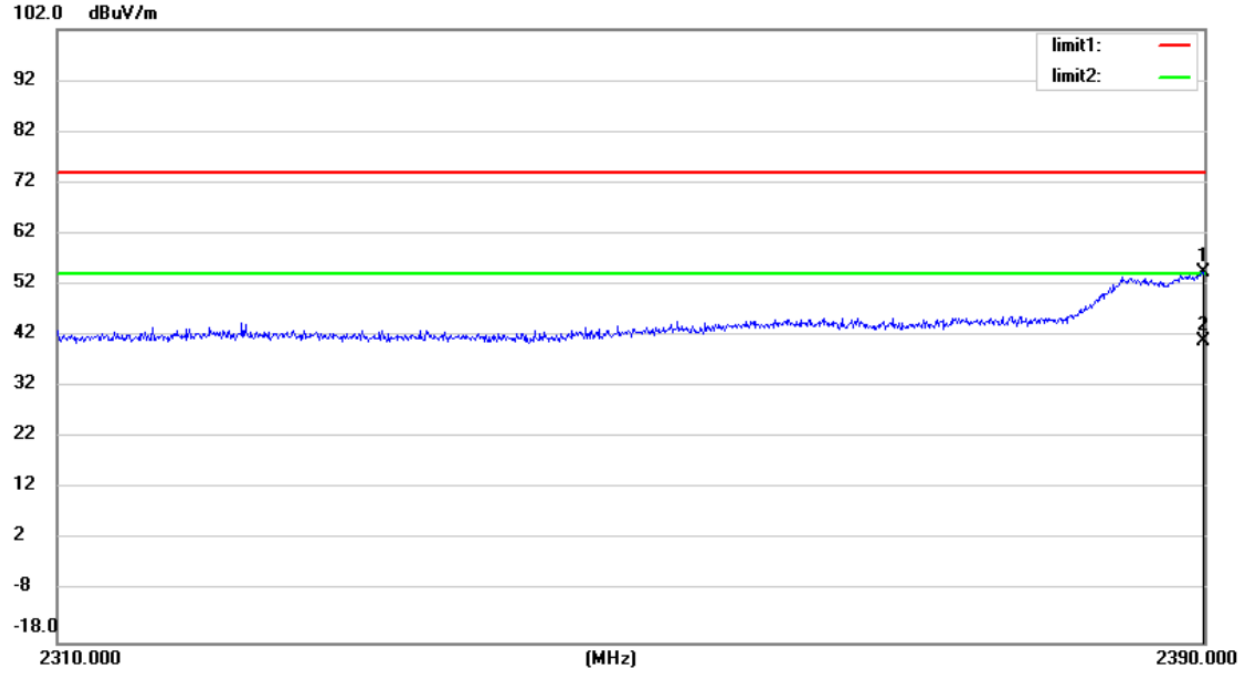
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2485.480	H	49.13	74.00	-24.87	29.75	54.00	-24.25
2483.912	V	59.57	74.00	-14.43	33.50	54.00	-20.50

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

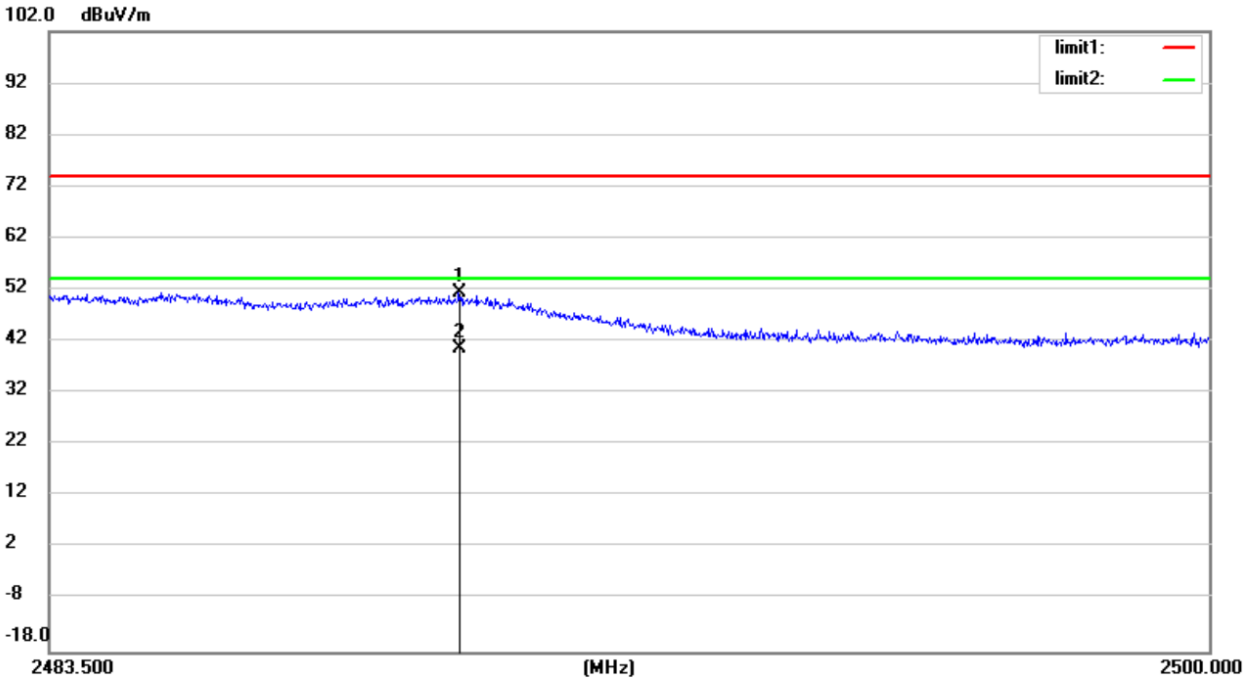
Test Model	Spurious Emission in Restricted Band 2310-2390MHz ☐802.11b ☐802.11g ☒802.11n(HT20) ☒Channel 1: 2412MHz ☐Channel 3: 2422MHz Polarity: H VBW=3MHz Test By: King Kong



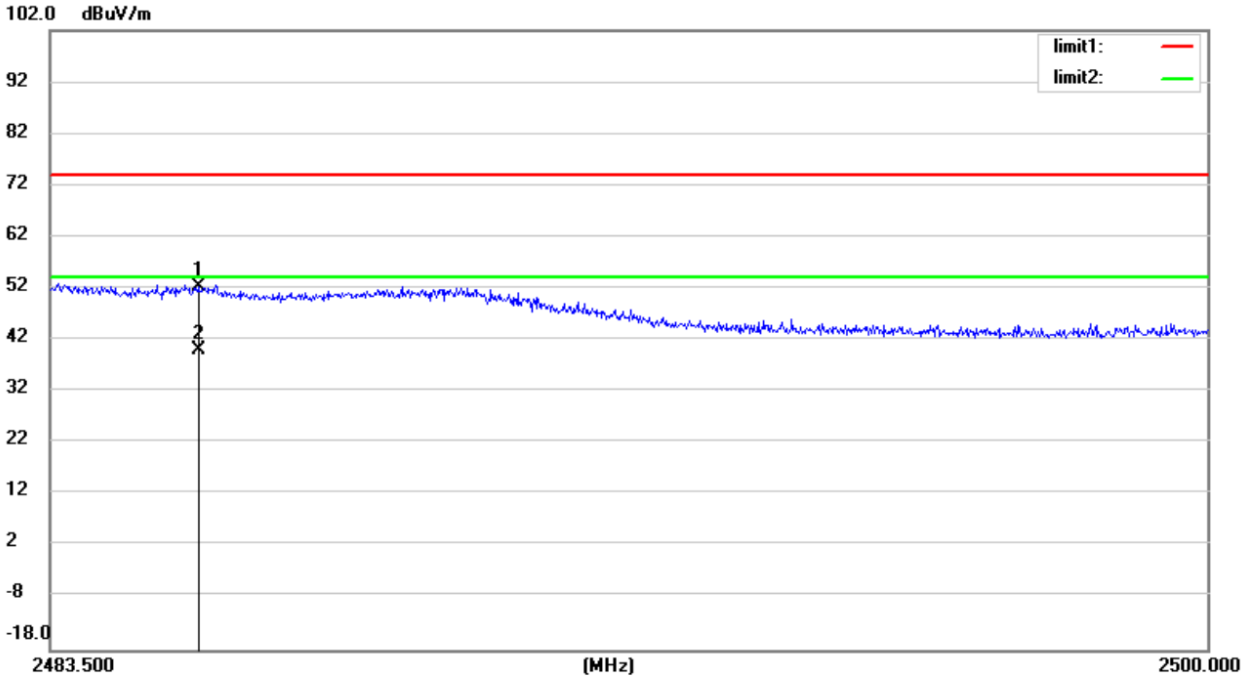
Test Model	Spurious Emission in Restricted Band 2310-2390MHz ☐802.11b ☐802.11g ☒802.11n(HT20) ☒Channel 1: 2412MHz ☐Channel 3: 2422MHz Polarity:V VBW=3MHz Test By: King Kong



Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz ☐802.11b ☐802.11g ☒802.11n(HT20) ☒Channel 11: 2462MHz ☐Channel 9: 2452MHz Polarity: H VBW=3MHz Test By: King Kong



Test Model	Spurious Emission in Restricted Band2483.5-2500MHz ☐802.11b ☐802.11g ☒802.11n(HT20) ☒Channel 11: 2462MHz ☐Channel 9: 2452MHz Polarity: V VBW=3MHz Test By: King Kong



11. Power Density

11.1 Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	FSV30	1321.3008K	05/23/2019	05/22/2020

11.2 Measuring Instruments and Setting

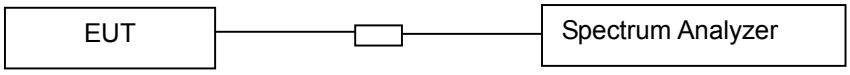
The following table is the setting of spectrum analyzer.

Spectrum analyzer	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS bandwidth.
RB	3kHz
VB	10KHz
Detector	Peak
Trace	Max hold
Sweep Time	Automatic

11.3 Test Procedures

a. The transmitter output (antenna port) was connected to the spectrum analyzer.
b. Set analyzer center frequency to DTS channel center frequency.
c. Set the analyzer span to a minimum of 1.5 times the DTS bandwidth.
d. Set the RBW ≥ 3 kHz. 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 amplitude level.

11.4 Block Diagram of Test Setup



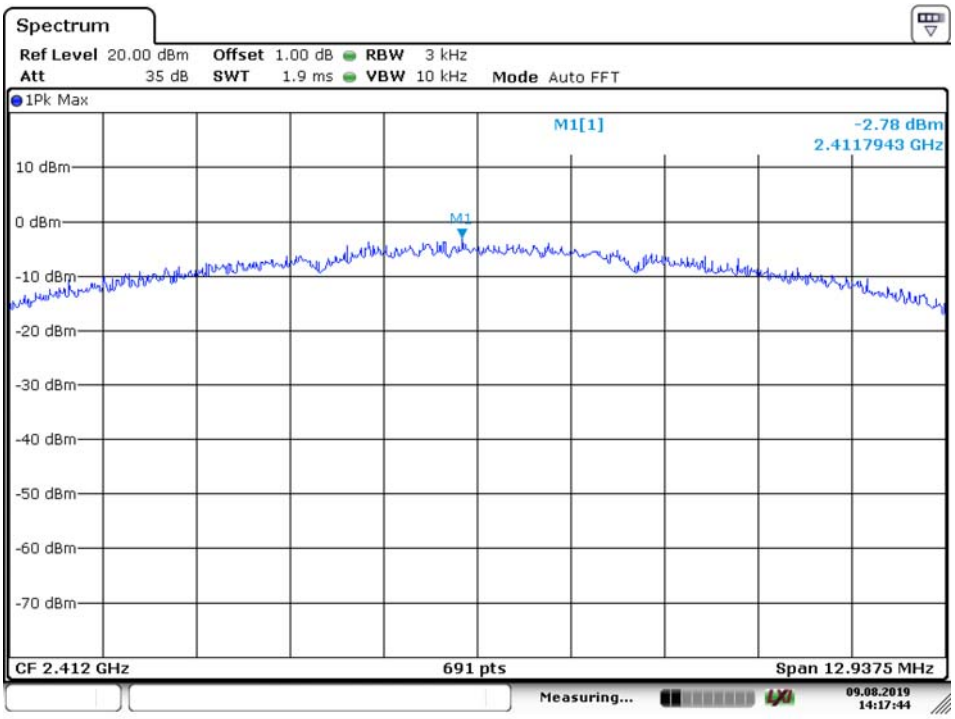
11.5 Limit

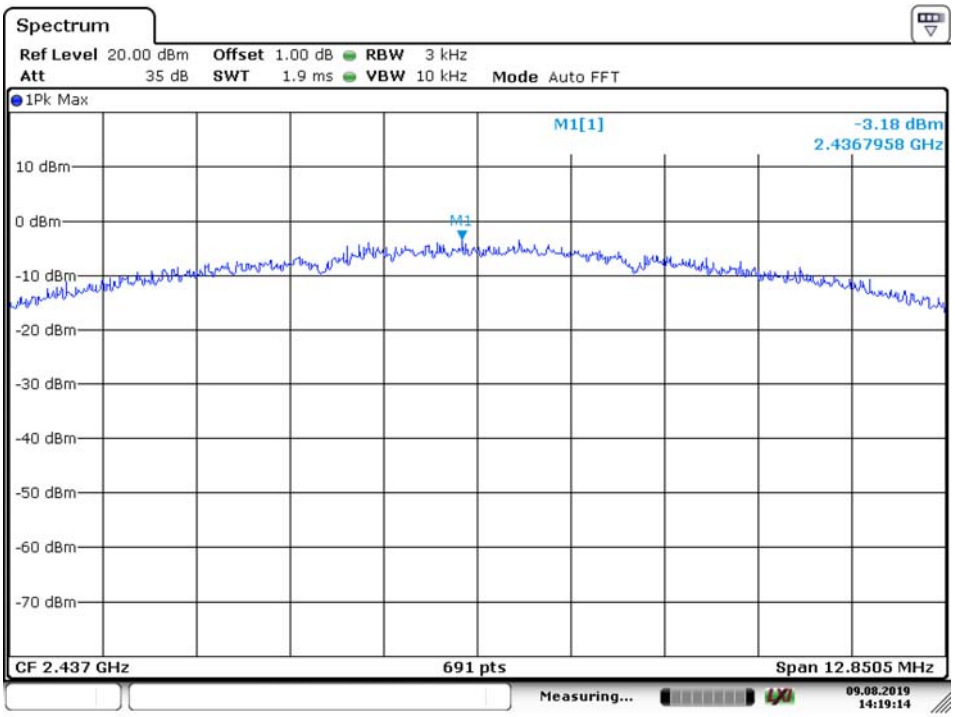
The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3 kHz bandwidth.

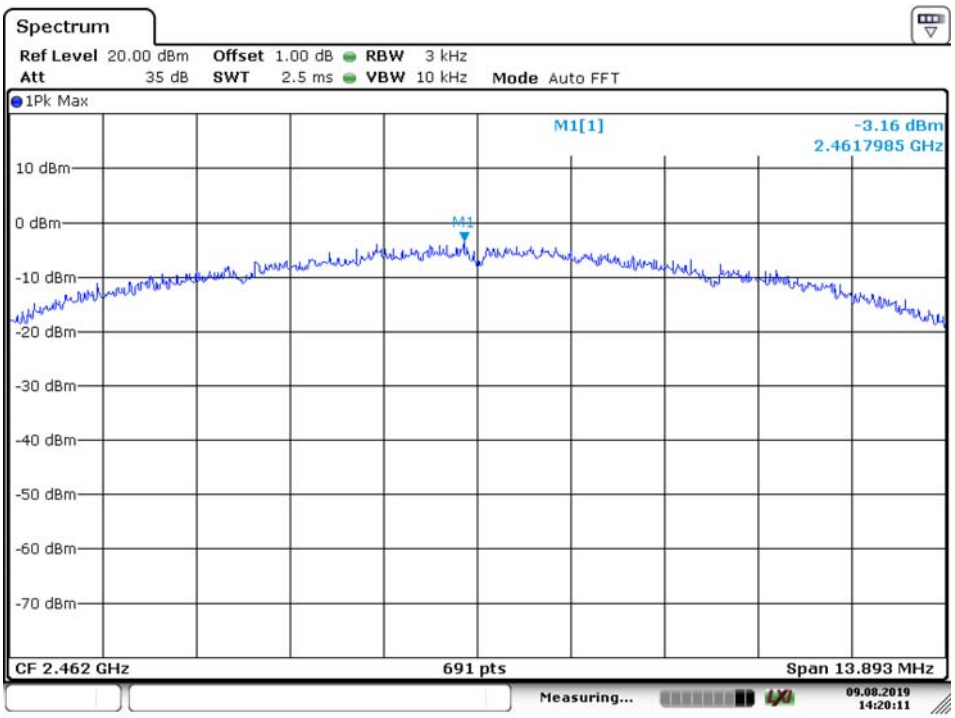
11.6Test Result

Spectrum Detector:	PK	Test Date :	August 09, 2019
Test By:	Andy	Temperature :	28℃
Test Result:	PASS	Humidity :	60%

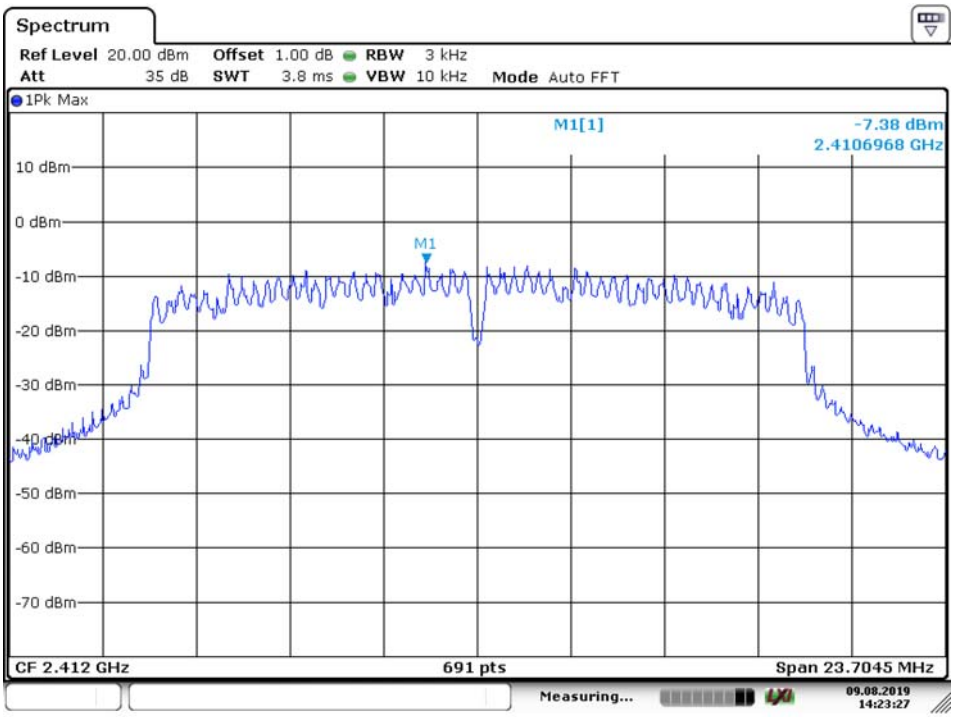
IEEE 802.11b			
Channel frequency (MHz)	Measurement level (dBm)	Limit(dBm)	Result
2412	-2.78	8	Pass
2437	-3.18		
2462	-3.16		

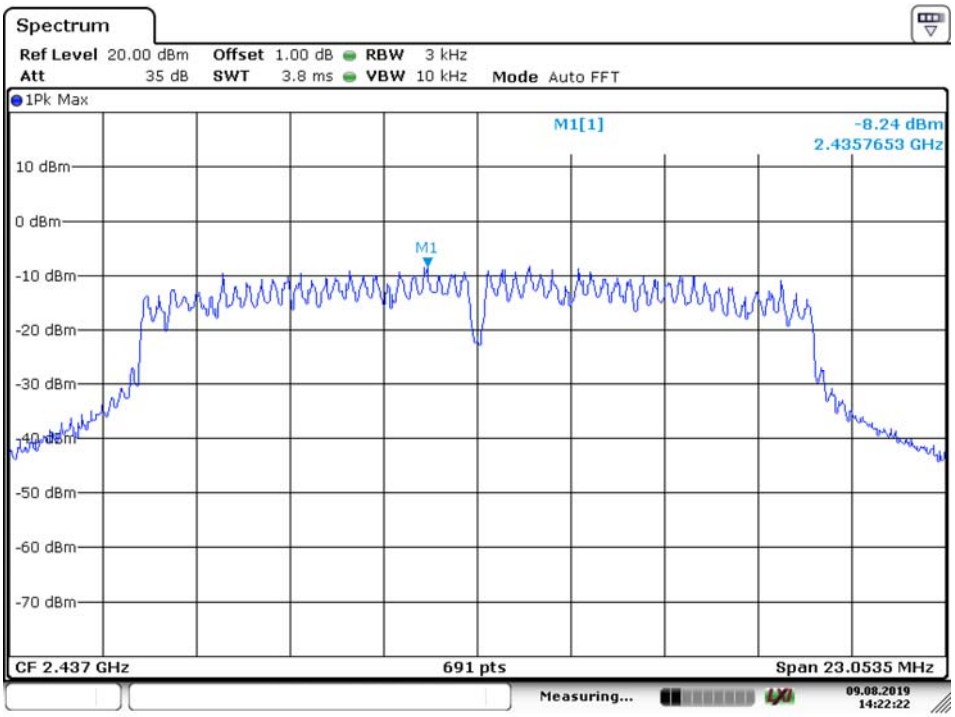


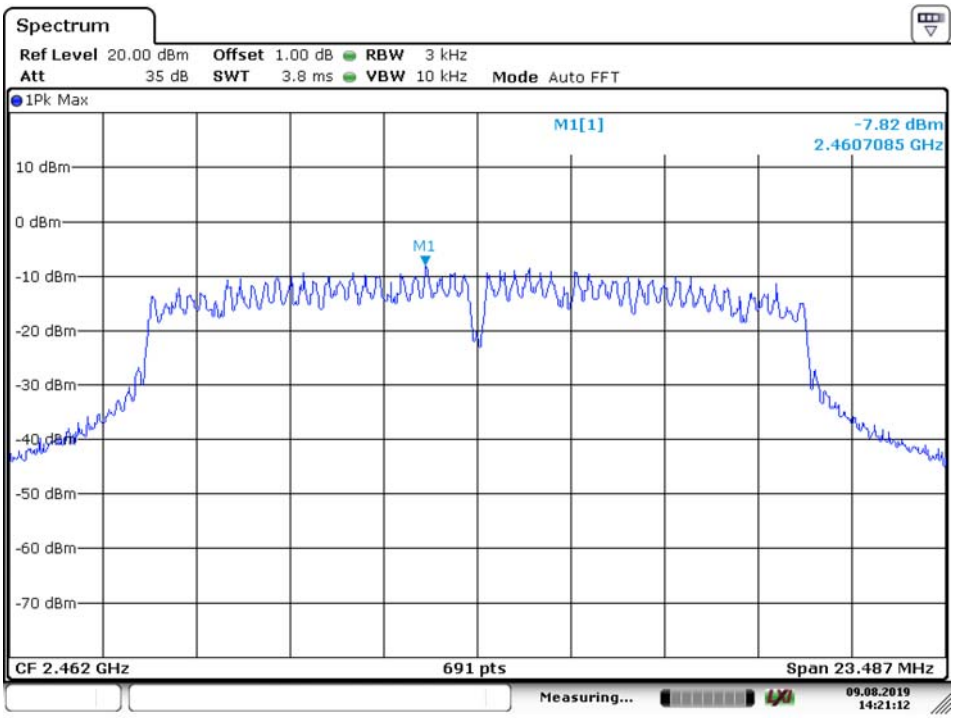

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 1.9 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -3.18 dBm
2.4367958 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 12.8505 MHz
Measuring...
09.08.2019
14:19:14


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 2.5 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -3.16 dBm
2.4617985 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 13.893 MHz
Measuring...
09.08.2019
14:20:11

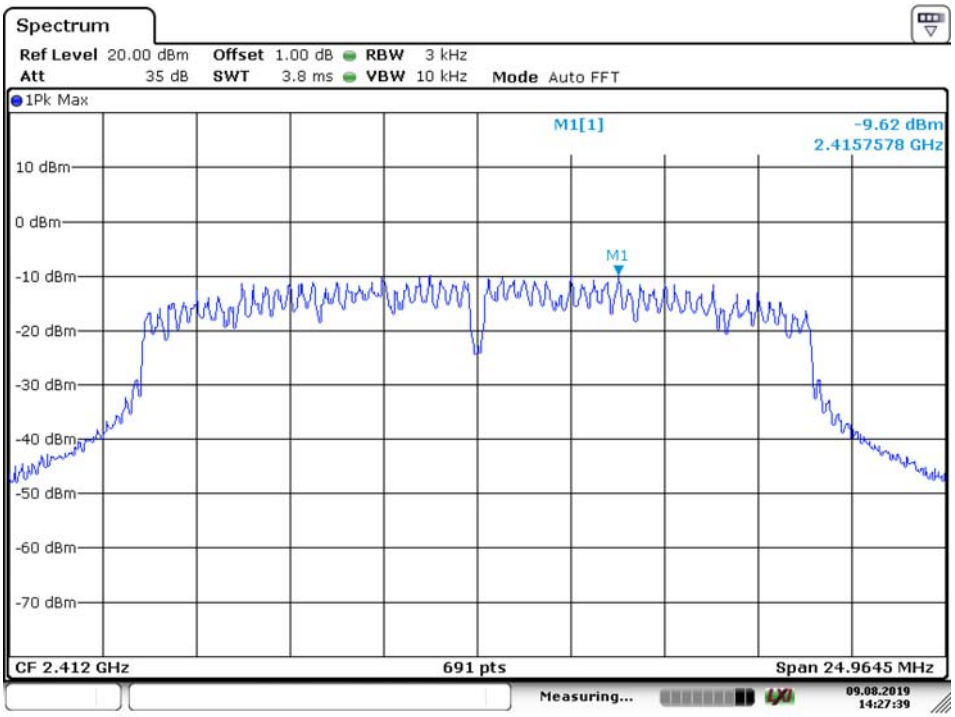
IEEE 802.11g			
Channel frequency (MHz)	Measurement level (dBm)	Limit(dBm)	Result
2412	-7.38	8	Pass
2437	-8.24		
2462	-7.82		

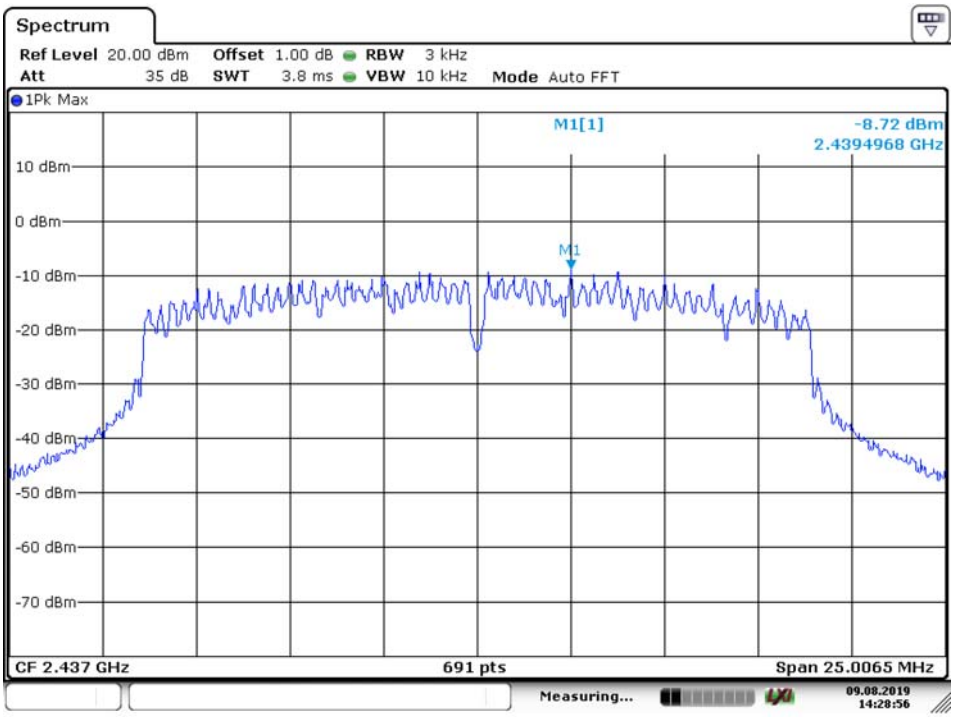


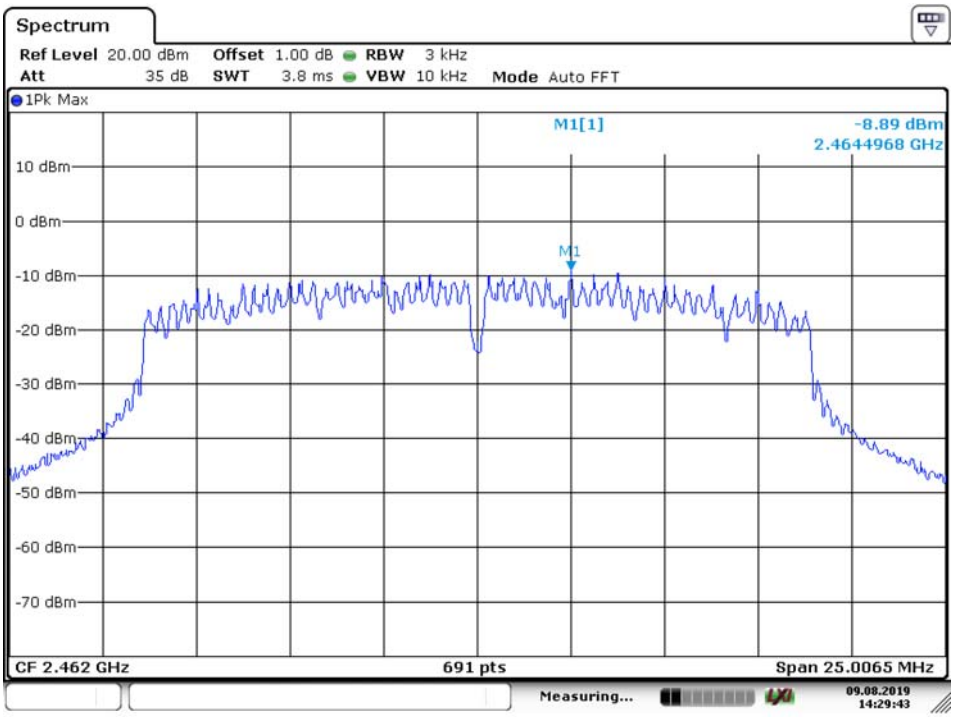



Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1]
-7.82 dBm
2.4607085 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.462 GHz
691 pts
Span 23.487 MHz
Measuring...
09.08.2019
14:21:12

IEEE 802.11n(HT20)			
Channel frequency (MHz)	Measurement level (dBm)	Limit(dBm)	Result
2412	-9.62	8	Pass
2437	-8.72		
2462	-8.89		






Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1]
-8.89 dBm
2.4644968 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.462 GHz
691 pts
Span 25.0065 MHz
Measuring...
09.08.2019
14:29:43

12. Antenna Port Emission

12.1 Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	FSV30	1321.3008K	05/23/2019	05/22/2020

12.2 Measuring Instruments and Setting

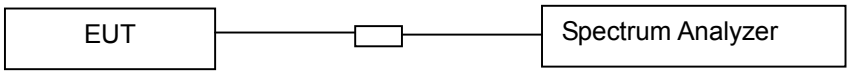
The following table is the setting of spectrum analyzer.

Spectrum analyzer	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

12.3 Test Procedures

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, Middle, and high channels, the limit was determined by attenuation 20dB of the RF peak power output.

12.4 Block Diagram of Test setup

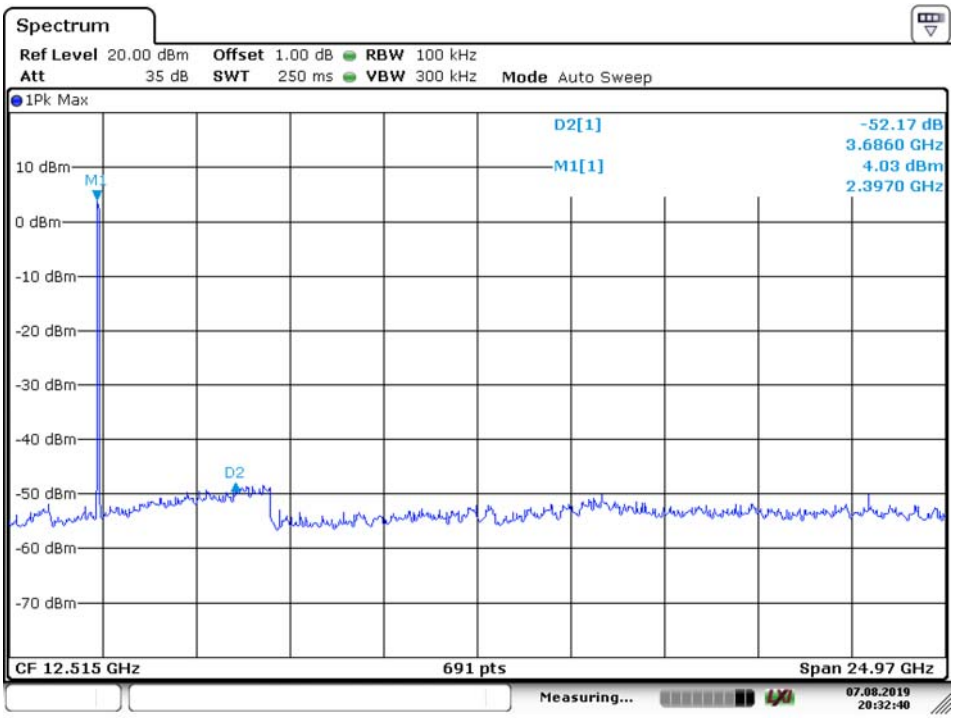


12.5 Test Result

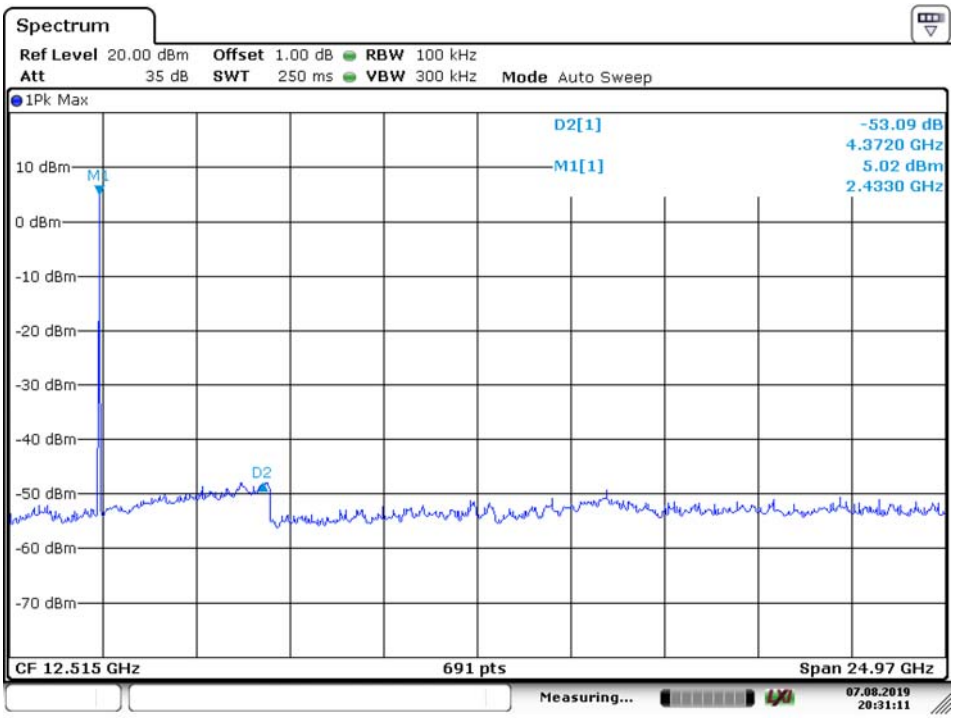
PASS.

Please refer to following pages.

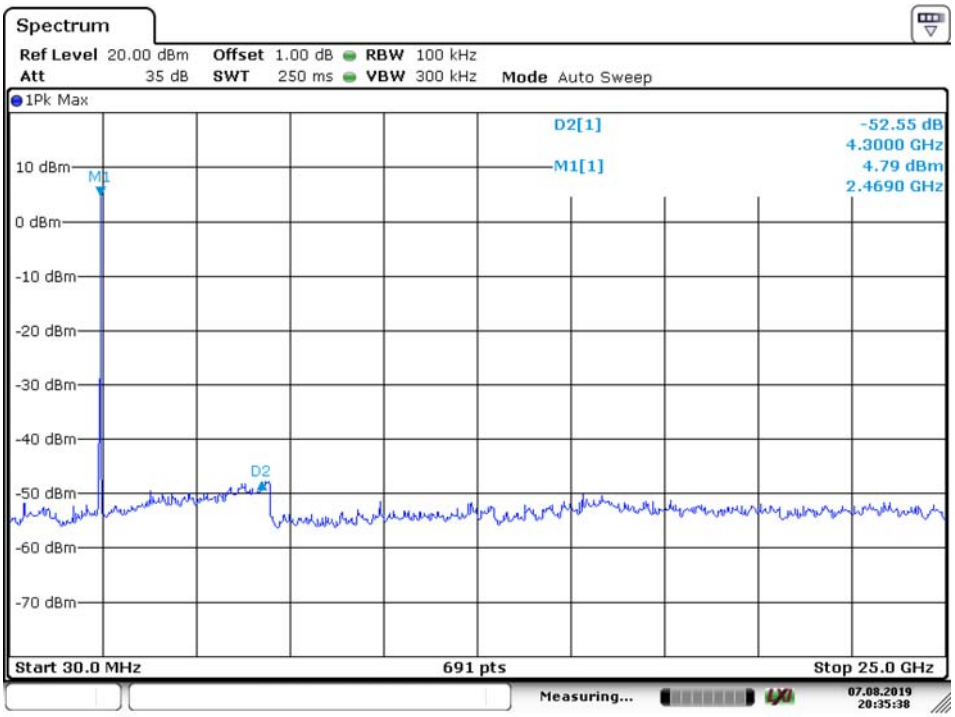
Test Mode: 802.11b



Lowest Channel

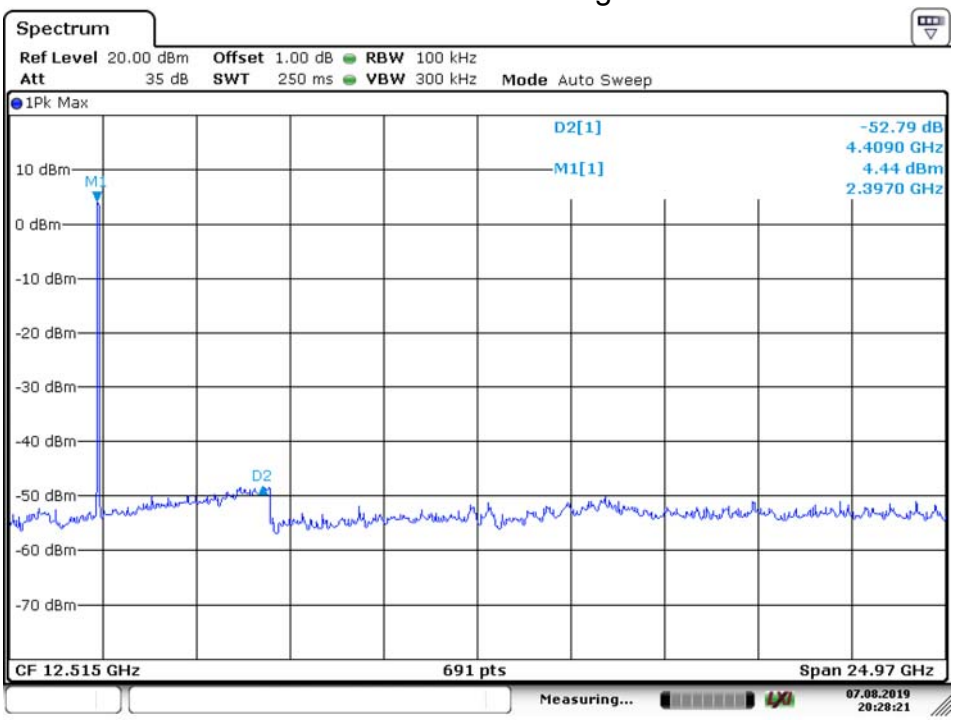


Middel Channel

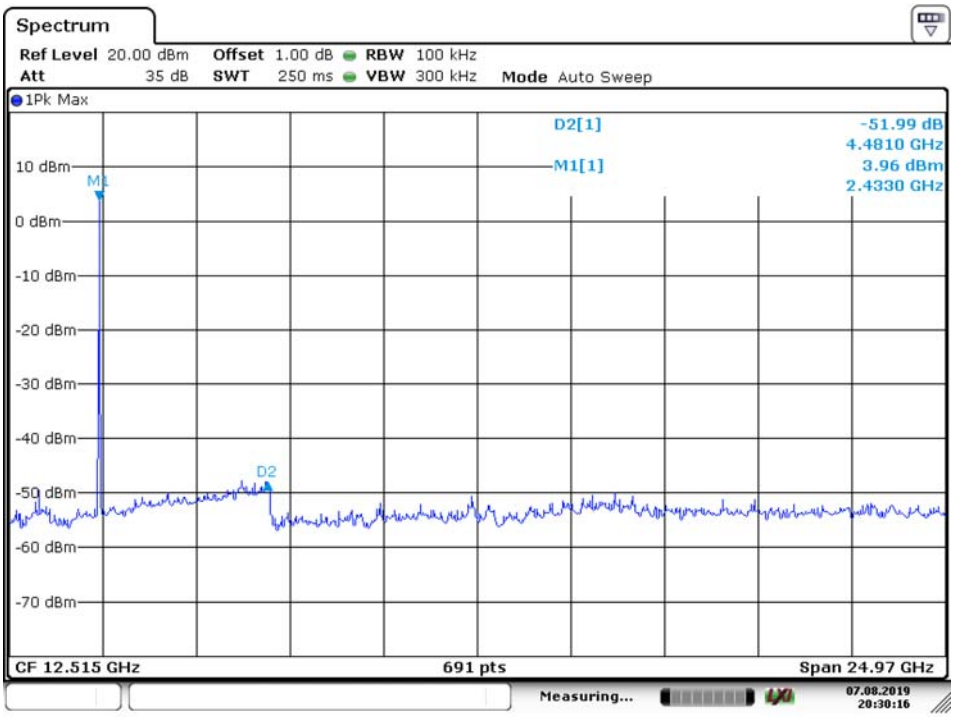


Highest Channel

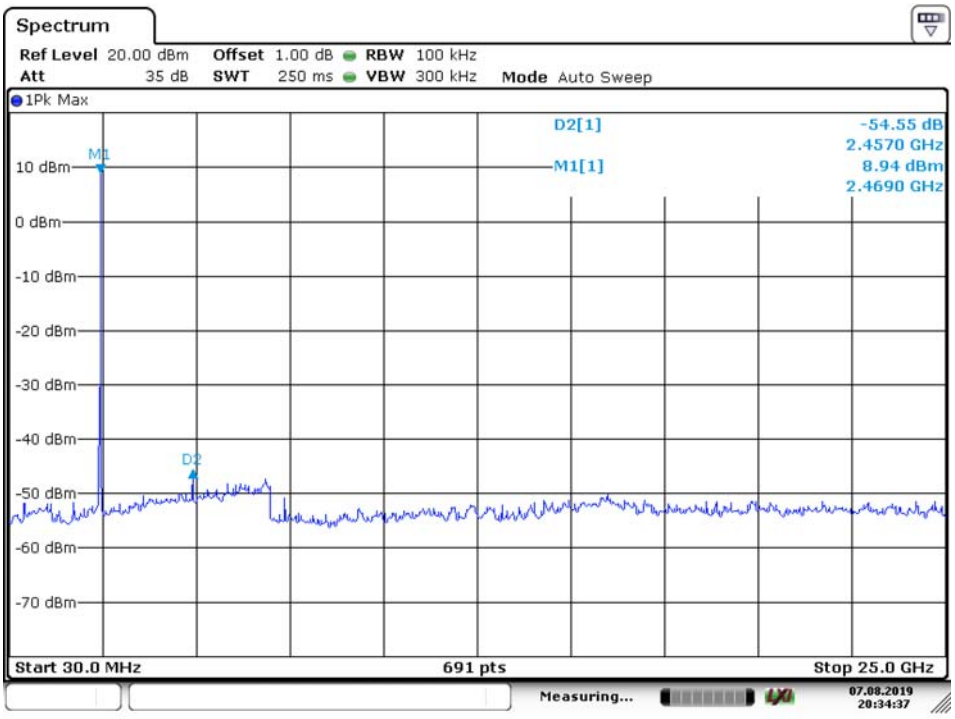
Test Mode: 802.11g



Lowest Channel

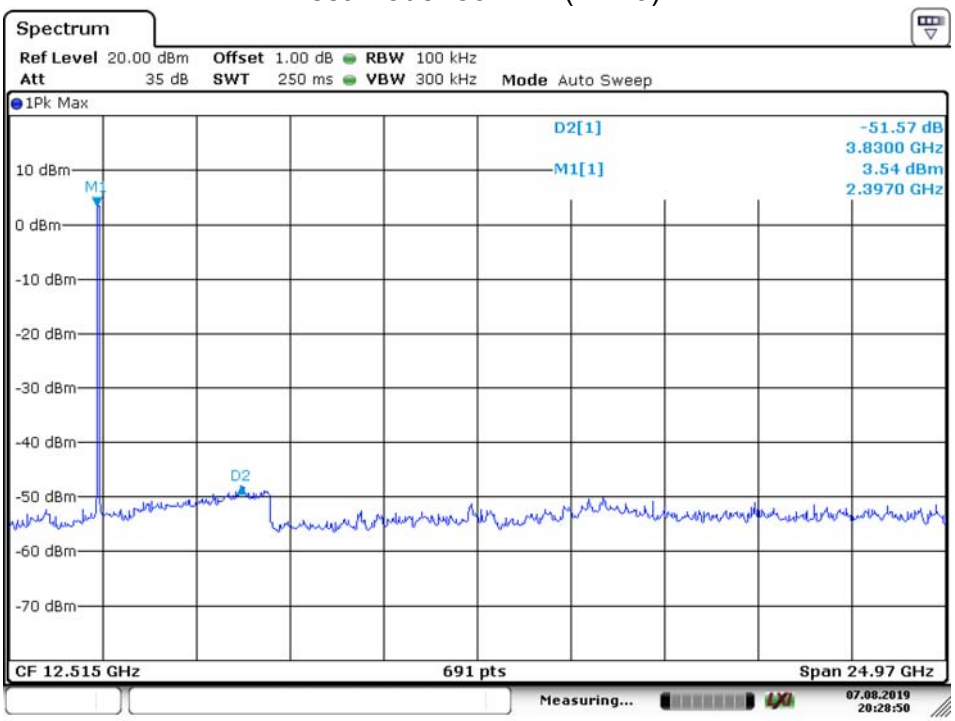


Middle Channel

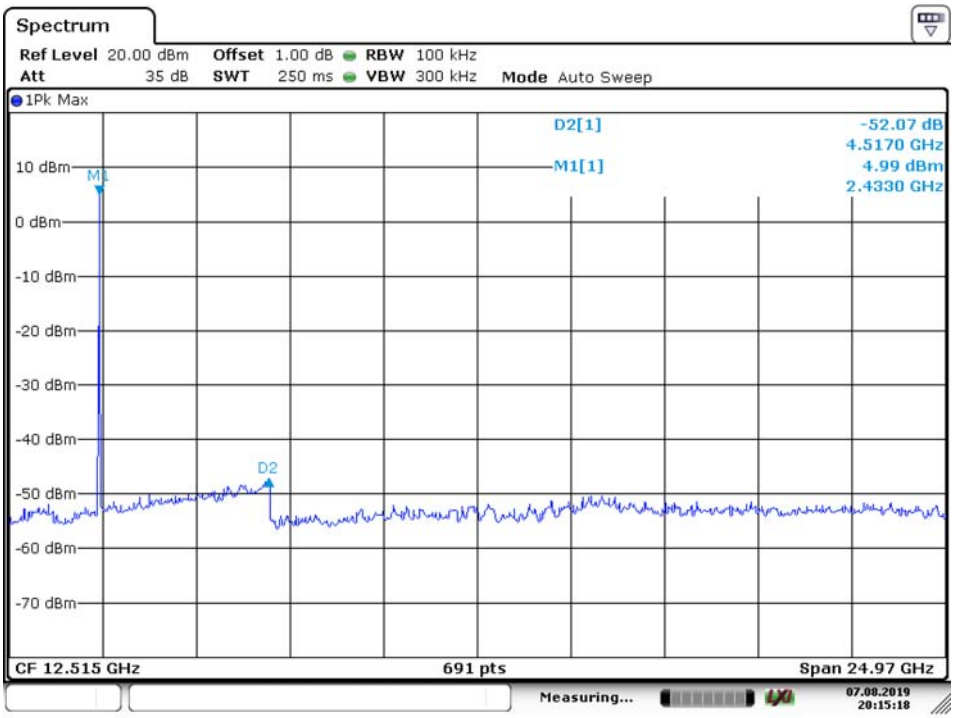


Highest Channel

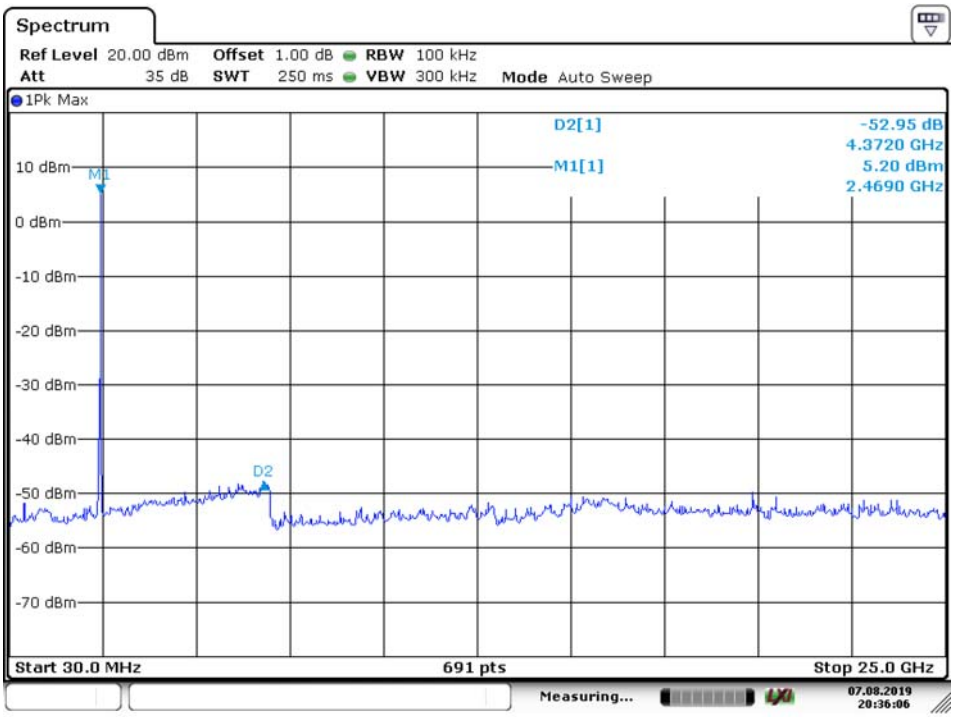
Test Mode: 802.11n(HT20)



Lowest Channel



Middle Channel



Highest Channel

13. Antenna Application

13.1 Antenna Requirement

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.

13.2 Result

The EUT'S antenna is an internal Metal antenna. The antenna's gain is 2.5 dBi and meets the requirement.

14. Photos of EUT

Please refer to external photos and internal photos.