FCC TEST REPORT

FCC ID: 2APORHEROGOGO

Product	:	HeroGoGo Hero Camera
Model Name	:	HeroGoGo 1, HeroGoGo 1S
Brand	:	HeroGoGo
Report No.	:	PTC18031415001E-FC01

Prepared for

Shenzhen Star-Navi Technology Co., Ltd.

Room 2203, Building B, Block three, Cloud Park Phase 1, Bantian Street, Longgang District, Shenzhen, China

Prepared by

Dongguan Precise Testing & Certification Corp., Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China

1 TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Star-Navi Technology Co., Ltd.
Address	:	Room 2203, Building B, Block three, Cloud Park Phase 1, Bantian Street, Longgang District, Shenzhen, China
Manufacture's name	:	Shenzhen Star-Navi Technology Co., Ltd.
Address	:	Room 2203, Building B, Block three, Cloud Park Phase 1, Bantian Street, Longgang District, Shenzhen, China
Product name	:	HeroGoGo Hero Camera
Model name	:	HeroGoGo 1, HeroGoGo 1S
Standards	:	FCC CFR47 Part 15 Section 15.247: 2017
Test procedure	:	ANSI C63.10:2013
Test Date	:	April 18, 2018 to May 04, 2018
Date of Issue	:	May 04, 2018
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Leo Yang

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

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2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious Emission	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS
Remark: N/A: Not Applicable		

3 General Information

3.1 General Description of E.U.T.

Product Name	:	HeroGoGo Hero Camera
Model Name	:	HeroGoGo 1, HeroGoGo 1S (Note: The samples are the same except appearance and model number. So HeroGoGo Hero was selected for test.)
Specification	:	802.11b/g/n HT20/n HT40
Operation Frequency	:	2412-2462MHz for 802.11b/g; 2412-2462MHz for 802.11n(HT20); 2422-2452MHz for 802.11n(HT40);
Number of Channel	:	11 channels for 802.11b/g; 11 channels for 802.11n(HT20); 7 channels for 802.11n(HT40);
Type of Modulation	:	DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;
Antenna installation	:	Internal PCB Antenna
Antenna Gain	:	2 dBi
Power supply	:	DC 3.8V, 1100mAh Battery
Hardware Version	:	zhuban_v3_0_20170928
Software Version	:	2.1.5.3.20180327

3.2 Channel List

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; 802.11n (HT40): MCS8) 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		

Frequency and Channel list for 802.11 n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	5	2432	8	2447
4	2427	6	2437	9	2452
		7	2442		

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

Test Frequency and channel for 802.11 n (HT40):

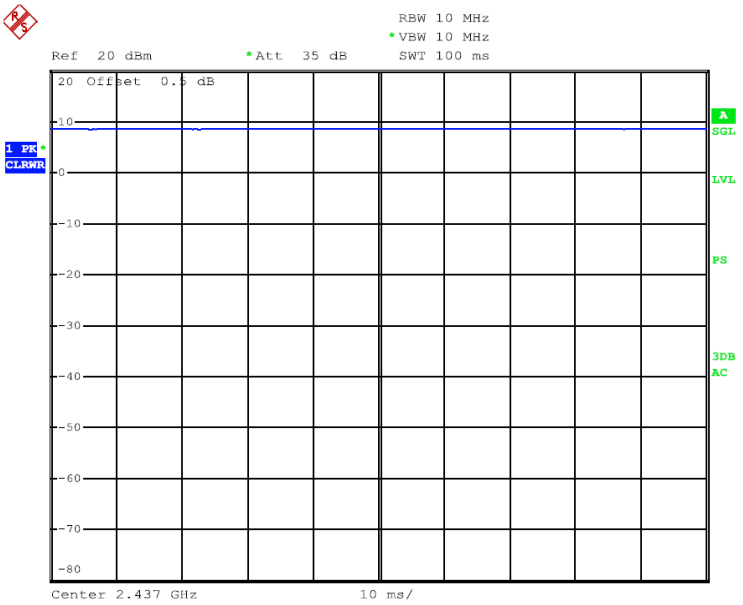
Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	6	2437	9	2452

The maximum duty cycle as following table:

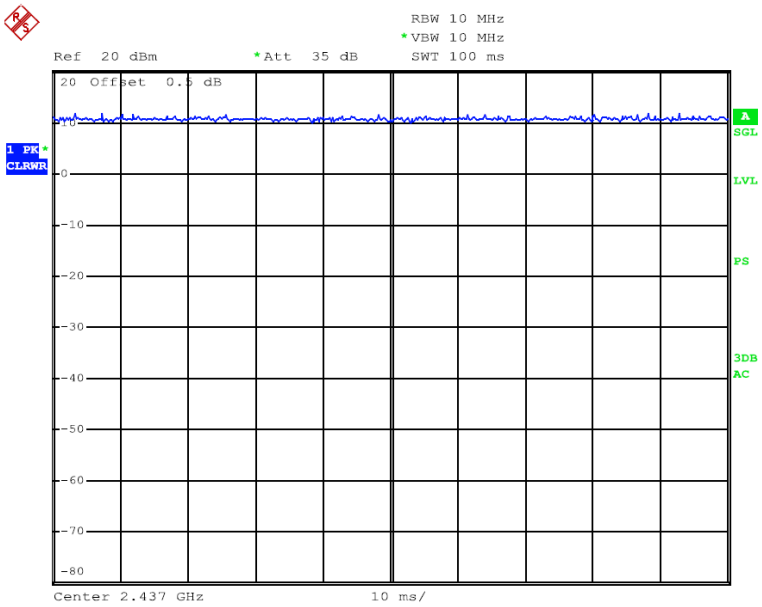
Test Mode	T_{on}(ms)	T_{on+off}(ms)	Duty Cycle(%)
802.11b	100	100	100%
802.11g	100	100	100%
802.11n(HT20)	100	100	100%
802.11n(HT40)	100	100	100%

Test Plots:

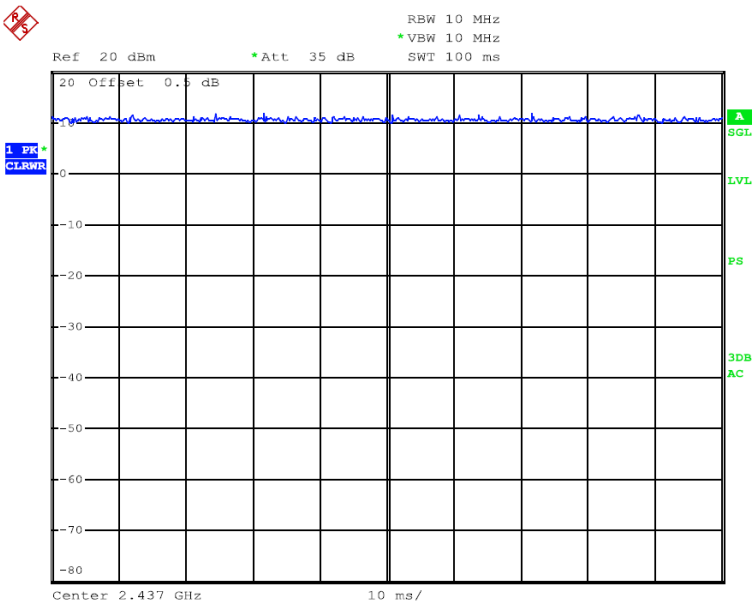
802.11b



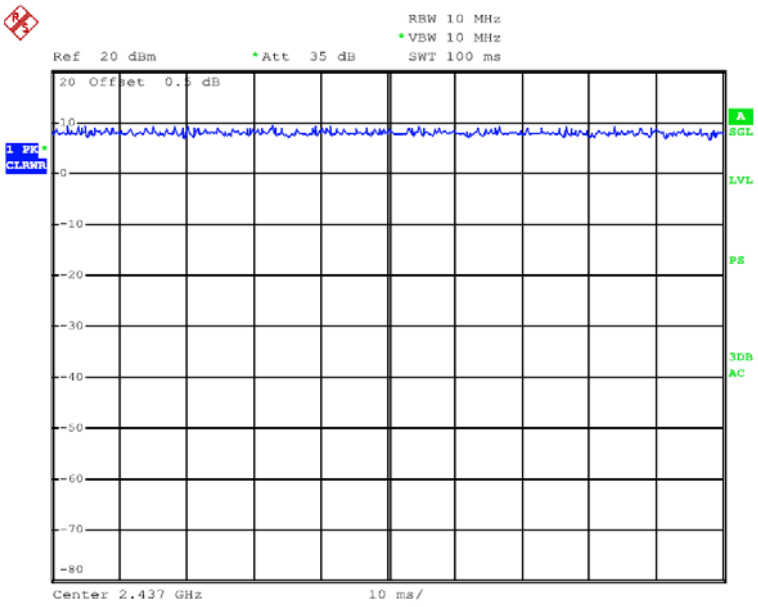
802.11g



802.11n(HT20)



802.11n(HT40)



3.3 Test Site

Dongguan Precise Testing & Certification Corp., Ltd.

Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

Test Lab: Shenzhen BCTC Testing Co., Ltd.

Address: BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Registered No.: 712850

Test items: Radiated Spurious Emission(18GHz to 25GHz)

4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Apr 07, 2019
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Oct 09, 2018

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(Test Frequency from 9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug 31, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 03, 2018
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 31, 2018
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 31, 2018
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 03, 2018

Radiated Emission (Test Frequency from 18GHz-25GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-26.5GHz	2018.08.26
Test Receiver	R&S	ESPI	101396	9KHz-7GHz	2018.08.26
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	2018.09.02
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	2018.08.26
RF Cable	R&S	R204	R21X	1GHz-40GHz	2018.08.26
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	2018.08.26

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep. 03, 2018

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

4.3 Description of Support Units

Equipment	Model No.	Series No.
Adapter	Model: PS65B150Y3000S Input: AC120V, 60Hz, 1.5A Output: DC 5V, 3000mA	N/A

5 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method	:	ANSI C63.10: 2013
Test Result	:	PASS
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B

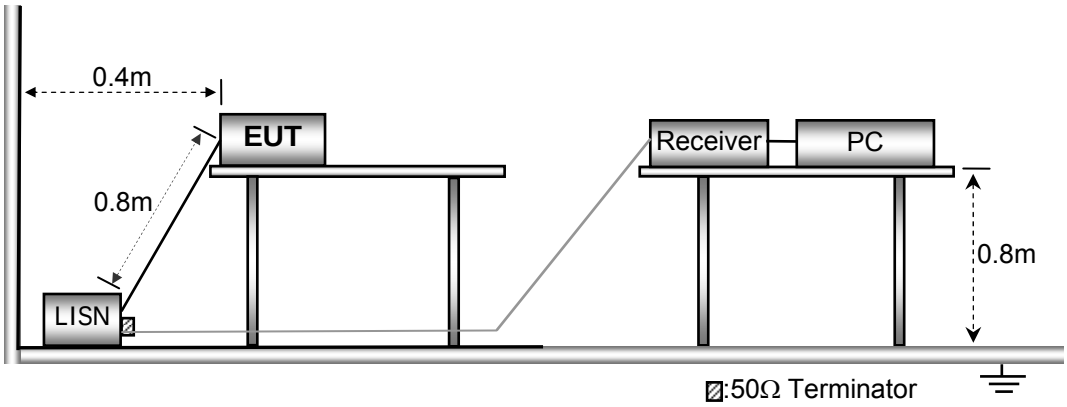
5.1 E.U.T. Operation

Operating Environment **:**

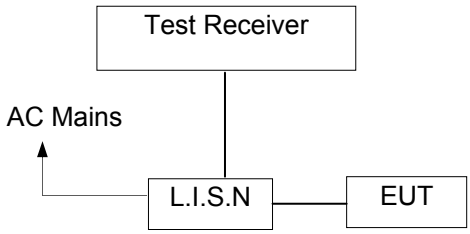
Temperature	:	25.5 °C
Humidity	:	51 % RH
Atmospheric Pressure	:	101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 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 was complete.

5.5 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.

5.6 Measurement Description

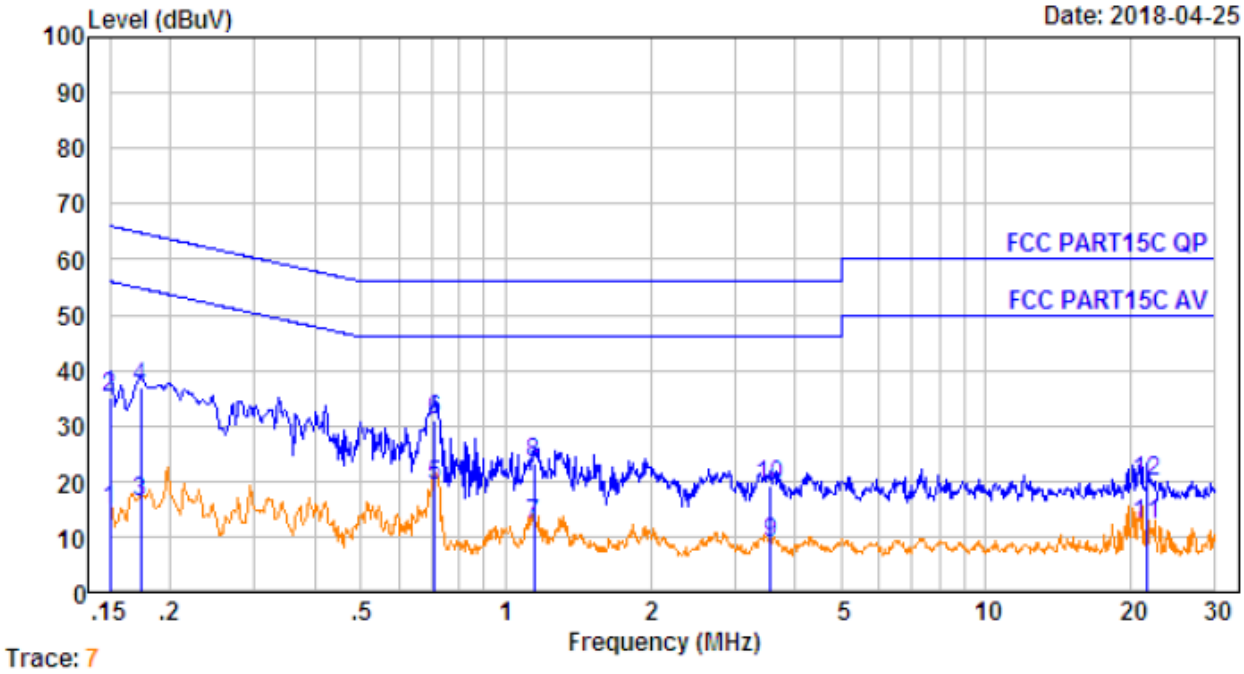
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

Pass.

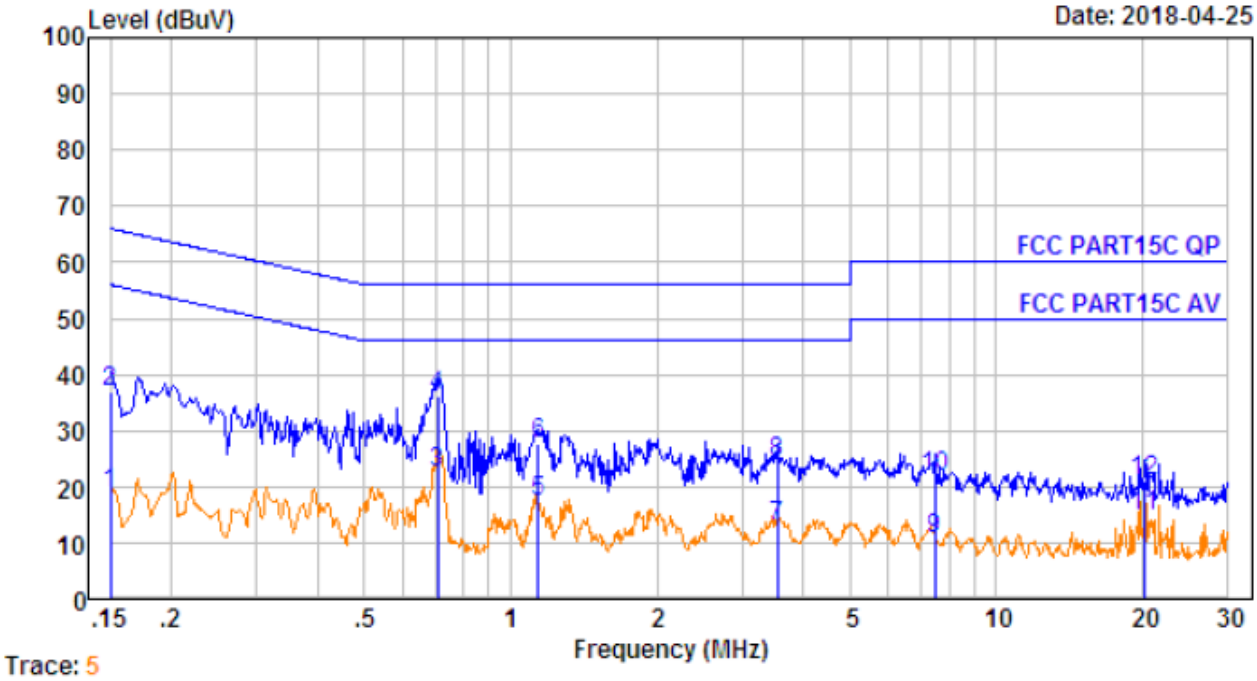
Please refer to the following pages.

Line-AC 120V/60Hz



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.150	0.21	9.50	5.11	14.82	56.00	-41.18	Average
2.	0.150	0.21	9.50	25.39	35.10	66.00	-30.90	QP
3.	0.174	0.24	9.54	6.52	16.30	54.77	-38.47	Average
4.	0.174	0.24	9.54	26.99	36.77	64.77	-28.00	QP
5.	0.712	0.44	9.80	9.03	19.27	46.00	-26.73	Average
6.	0.712	0.44	9.80	20.68	30.92	56.00	-25.08	QP
7.	1.147	0.46	9.83	1.95	12.24	46.00	-33.76	Average
8.	1.147	0.46	9.83	12.77	23.06	56.00	-32.94	QP
9.	3.565	0.47	9.89	-1.66	8.70	46.00	-37.30	Average
10.	3.565	0.47	9.89	8.70	19.06	56.00	-36.94	QP
11.	21.715	0.45	9.86	2.03	12.34	50.00	-37.66	Average
12.	21.715	0.45	9.86	9.48	19.79	60.00	-40.21	QP

Neutral-AC 120V/60Hz



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.150	0.21	9.50	8.97	18.68	56.00	-37.32	Average
2.	0.150	0.21	9.50	27.34	37.05	66.00	-28.95	QP
3.	0.708	0.44	9.80	12.19	22.43	46.00	-23.57	Average
4.	0.708	0.44	9.80	25.95	36.19	56.00	-19.81	QP
5.	1.141	0.46	9.83	7.07	17.36	46.00	-28.64	Average
6.	1.141	0.46	9.83	17.35	27.64	56.00	-28.36	QP
7.	3.547	0.47	9.89	2.48	12.84	46.00	-33.16	Average
8.	3.547	0.47	9.89	13.85	24.21	56.00	-31.79	QP
9.	7.486	0.55	9.98	0.21	10.74	50.00	-39.26	Average
10.	7.486	0.55	9.98	11.35	21.88	60.00	-38.12	QP
11.	20.270	0.40	9.84	4.65	14.89	50.00	-35.11	Average
12.	20.270	0.40	9.84	10.95	21.19	60.00	-38.81	QP

6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation

Operating Environment :

Temperature: : 23.5 °C

Humidity: : 51.1 % RH

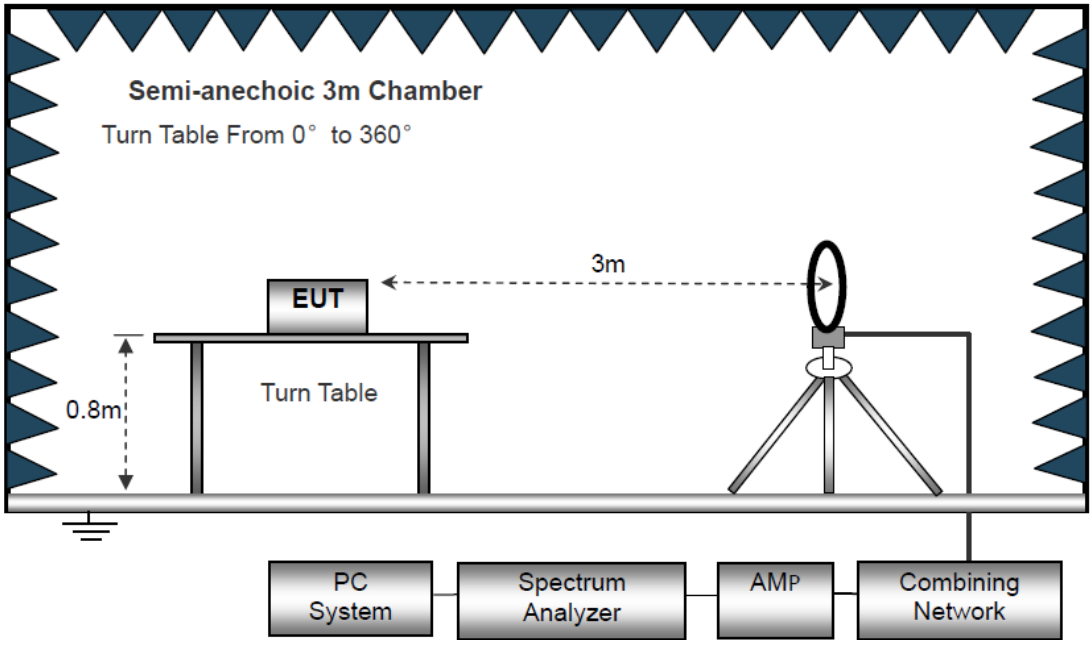
Atmospheric Pressure: : 101.2kPa

Test Voltage : DC 3.8V Battery

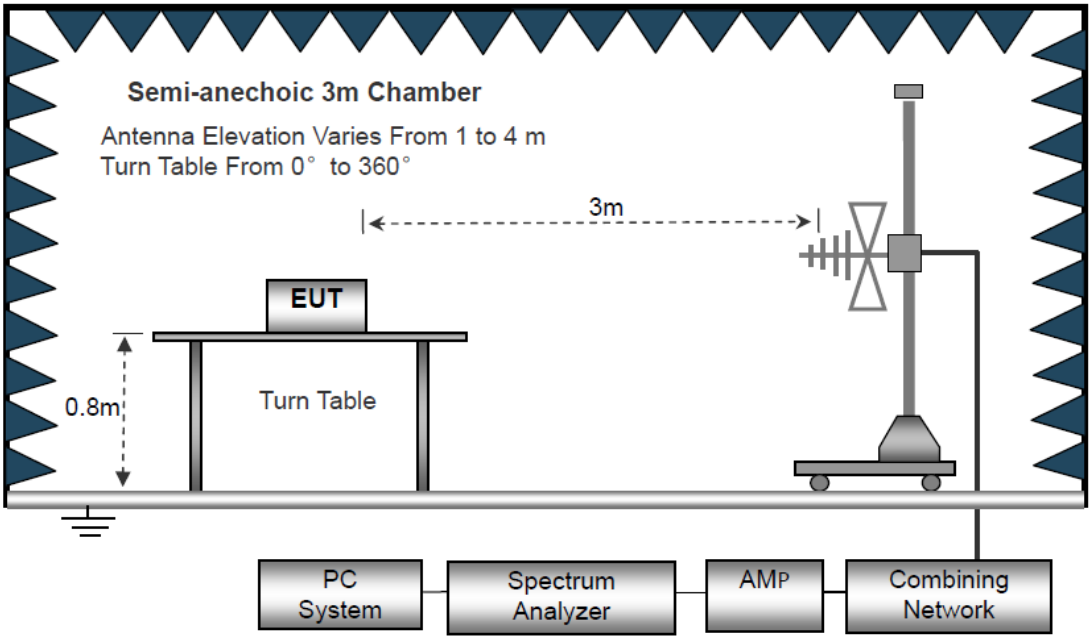
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

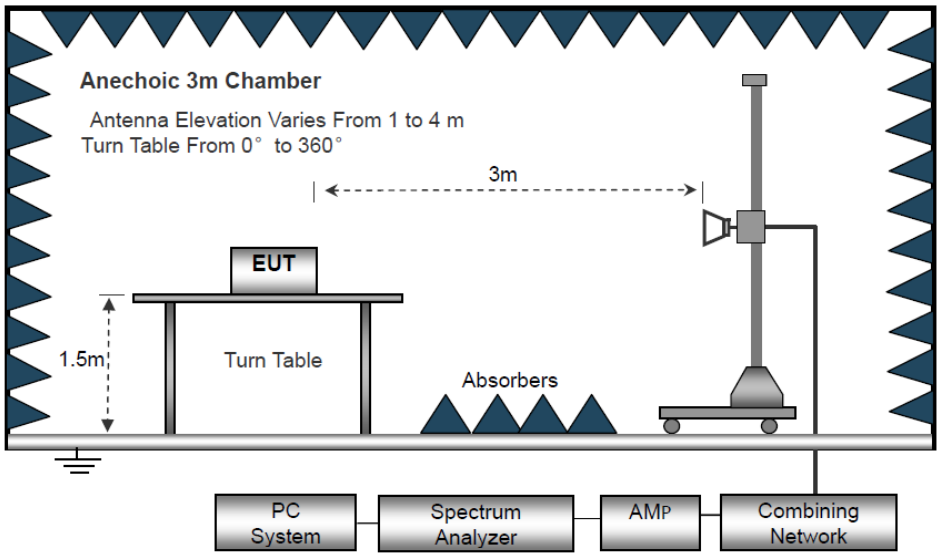
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

Below 30MHz			
IF Bandwidth	:	10kHz	
Resolution Bandwidth	:	10kHz	
Video Bandwidth	:	10kHz	
30MHz ~ 1GHz			
Detector	:	PK	QP
Resolution Bandwidth	:	100kHz	120kHz
Video Bandwidth	:	300kHz	300kHz
Above 1GHz			
Detector	:	PK	AV
Resolution Bandwidth	:	1MHz	1MHz
Video Bandwidth	:	3MHz	10Hz

6.4 Test 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. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), 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.

8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room

6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

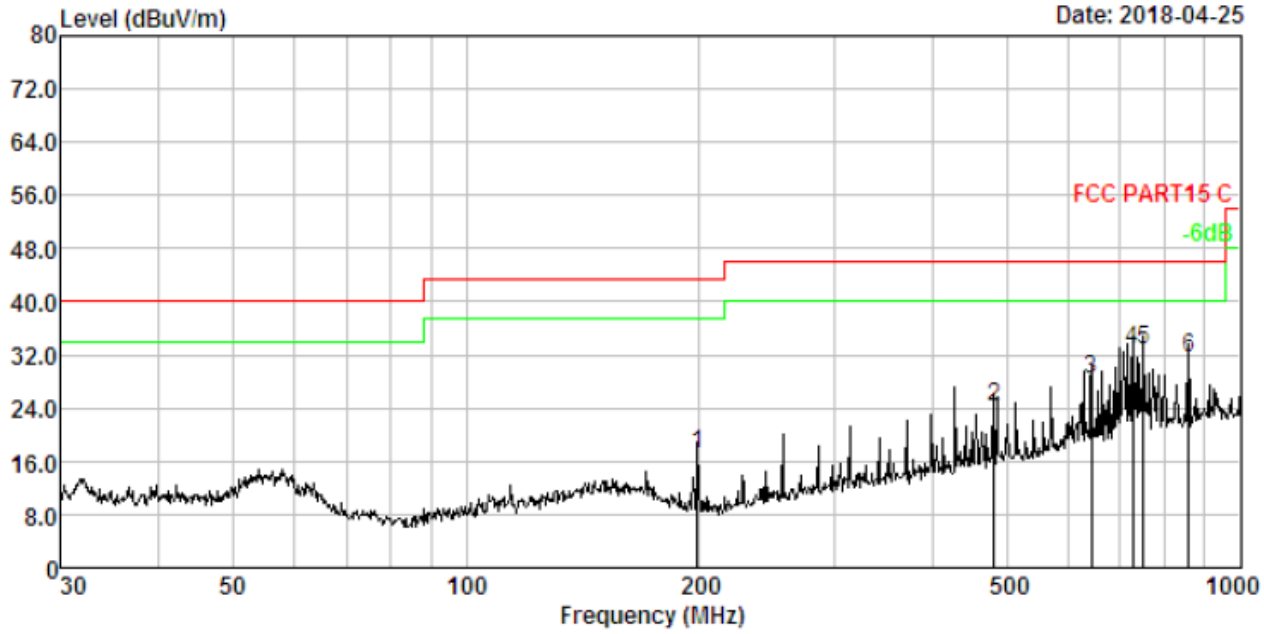
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

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

Please refer to the following test plots:

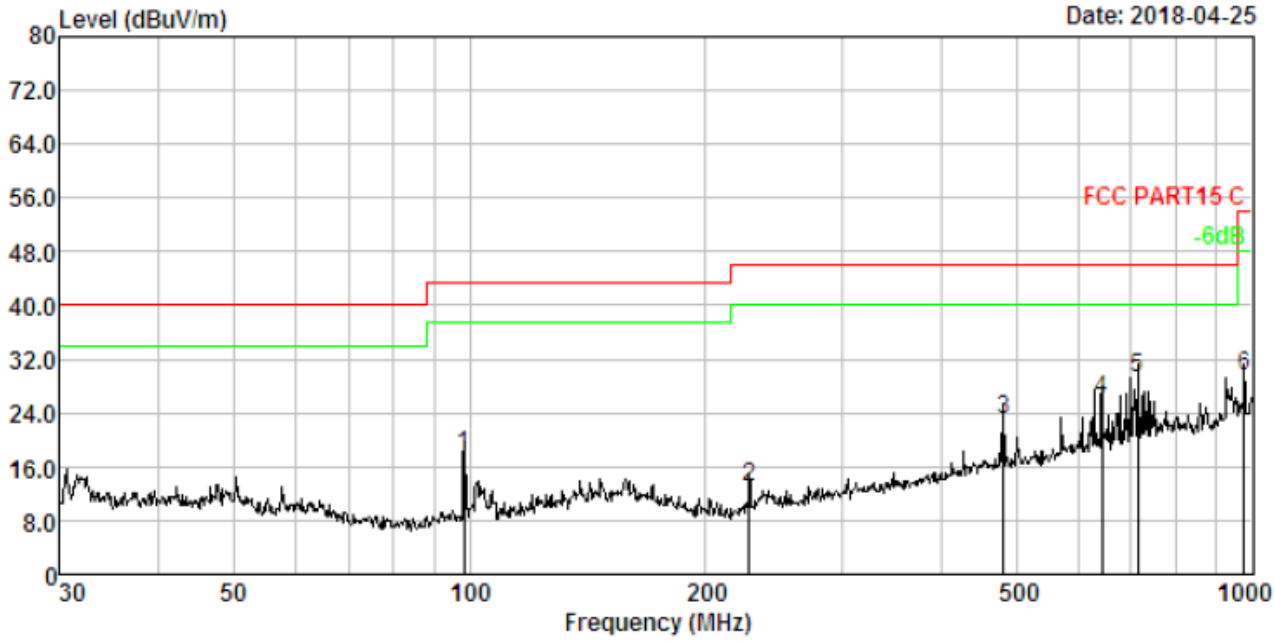
Antenna Polarization: Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB	Receiver Reading dBuV/m	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	199.286	2.77	10.43	34.41	30.63	16.98	43.50	-26.52	QP
2.	480.528	3.57	16.89	34.60	30.94	24.12	46.00	-21.88	QP
3.	642.861	3.83	19.49	36.14	31.04	28.42	46.00	-17.58	QP
4.	726.805	3.94	20.66	39.23	31.08	32.75	46.00	-13.25	QP
5.	750.108	3.97	21.35	38.47	31.09	32.70	46.00	-13.30	QP
6.	857.025	4.09	22.06	36.50	31.14	31.51	46.00	-14.49	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Antenna Polarization: Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB	Receiver Reading dBuV/m	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	98.487	2.13	10.09	35.80	30.38	17.64	43.50	-25.86	QP
2.	227.691	2.89	11.14	29.74	30.68	13.09	46.00	-32.91	QP
3.	480.528	3.57	16.89	33.46	30.94	22.98	46.00	-23.02	QP
4.	642.861	3.83	19.49	33.81	31.04	26.09	46.00	-19.91	QP
5.	714.173	3.93	20.40	36.09	31.07	29.35	46.00	-16.65	QP
6.	975.753	4.21	23.43	32.97	31.18	29.43	54.00	-24.57	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test Frequency: From 1GHz to 18GHz

Low Channel (2412MHz) Worst case 802.11g

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824	26.32	AV	V	9.13	8.06	8.52	34.99	54	-19.01
4824	25.82	AV	H	9.13	8.06	8.52	34.49	54	-19.51
4824	27.41	PK	V	9.13	8.06	8.52	36.08	74	-37.92
4824	28.06	PK	H	9.13	8.06	8.52	36.73	74	-37.27
17246	26.18	AV	V	10.22	8.39	10.44	34.35	54	-19.65
17246	28.54	AV	H	10.22	8.39	10.44	36.71	54	-17.29
17246	29.01	PK	V	10.22	8.39	10.44	37.18	74	-36.82
17246	30.69	PK	H	10.22	8.39	10.44	38.86	74	-35.14

Middle Channel (2437MHz) Worst case 802.11n (HT20)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874	25.06	AV	V	9.35	8.72	9.36	33.77	54	-20.23
4874	24.18	AV	H	9.35	8.72	9.36	32.89	54	-21.11
4874	26.03	PK	V	9.35	8.72	9.36	34.74	74	-39.26
4874	28.15	PK	H	9.35	8.72	9.36	36.86	74	-37.14
16854	25.92	AV	V	12.08	9.27	11.05	36.22	54	-17.78
16854	29.57	AV	H	12.08	9.27	11.05	39.87	54	-14.13
16854	28.42	PK	V	12.08	9.27	11.05	38.72	74	-35.28
16854	28.68	PK	H	12.08	9.27	11.05	38.98	74	-35.02

High Channel (2462MHz) Worst case 802.11b

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924	28.65	AV	V	9.28	8.35	9.36	36.92	54	-17.08
4924	29.43	AV	H	9.28	8.35	9.36	37.7	54	-16.3
4924	30.15	PK	V	9.28	8.35	9.36	38.42	74	-35.58
4924	29.35	PK	H	9.28	8.35	9.36	37.62	74	-36.38
17546	31.06	AV	V	10.26	8.46	9.13	40.65	54	-13.35
17546	28.42	AV	H	10.26	8.46	9.13	38.01	54	-15.99
17546	29.55	PK	V	10.26	8.46	9.13	39.14	74	-34.86
17546	28.48	PK	H	10.26	8.46	9.13	38.07	74	-35.93

Note:

1. The testing has been conformed to 10*2462MHz=24620MHz.
2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor
   Margin=Emission Level-Limit
4. X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

Test Frequency: From 18GHz to 25GHz

The measurements were more than 20dB below the limit and not reported.

7 Conducted Spurious Emission

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

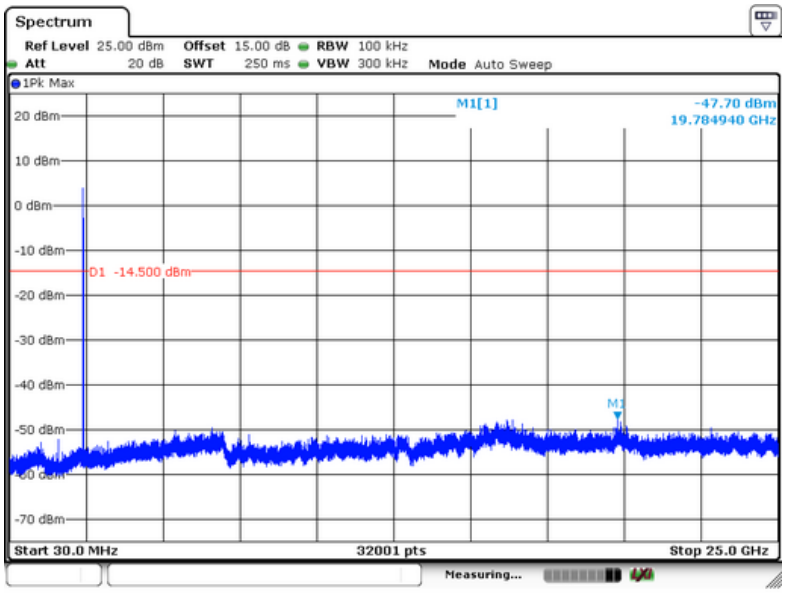
7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

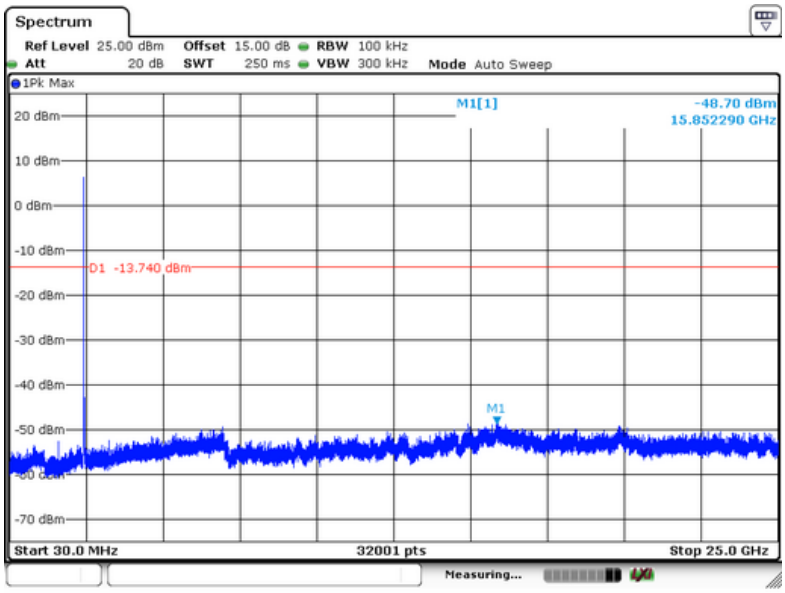
7.2 Test Result

802.11 b

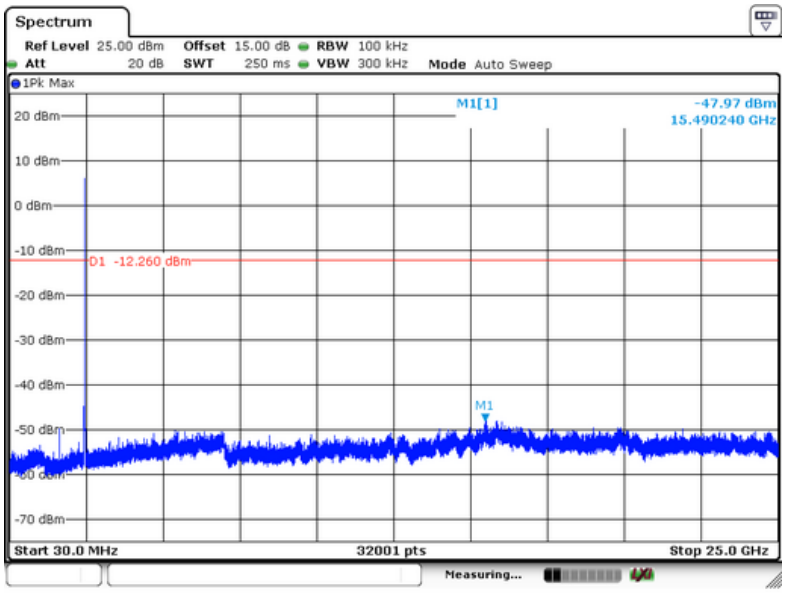
Low Channel



Middle Channel

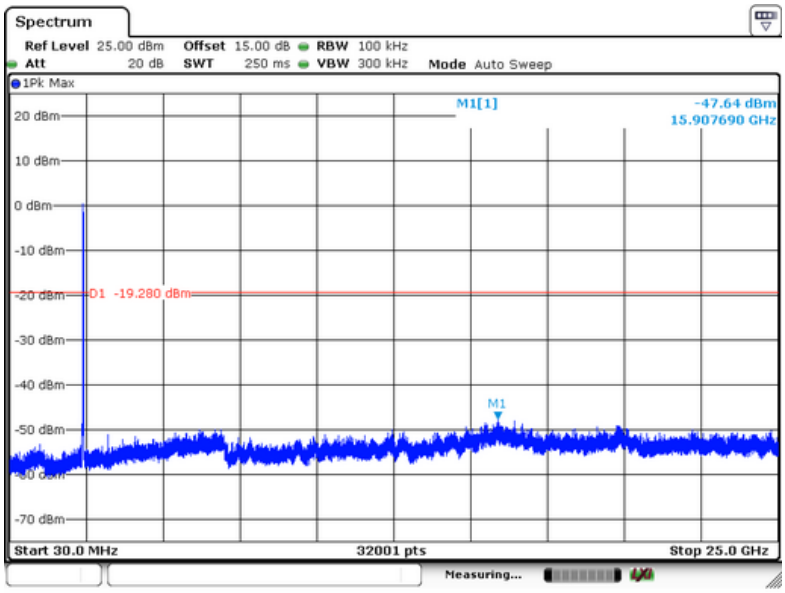


High Channel

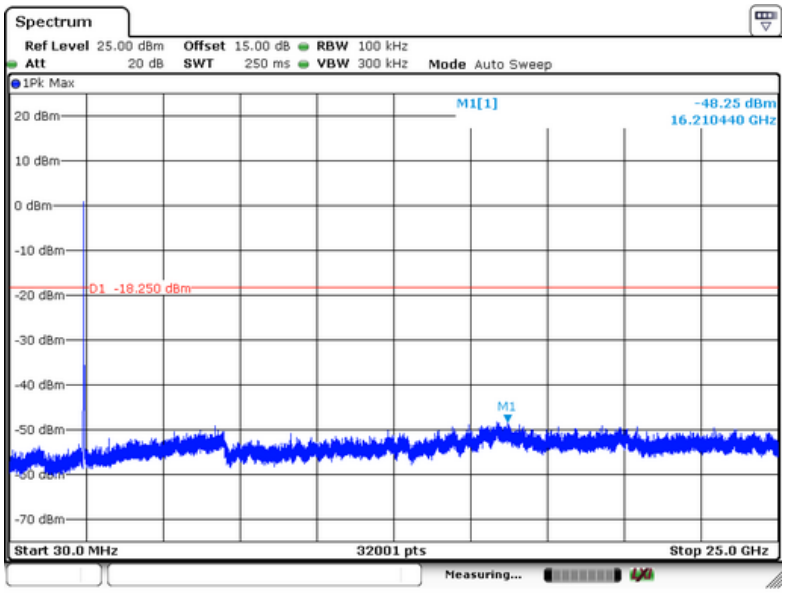


802.11g

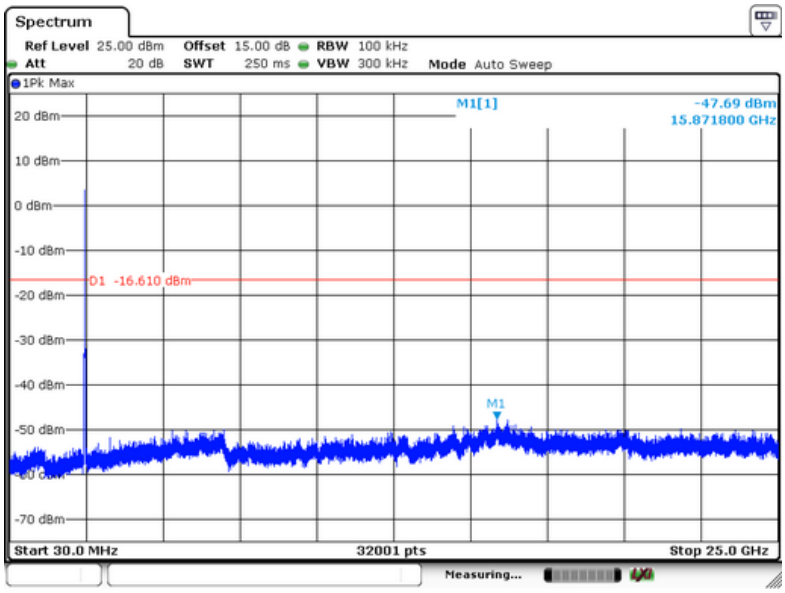
Low Channel



Middle Channel

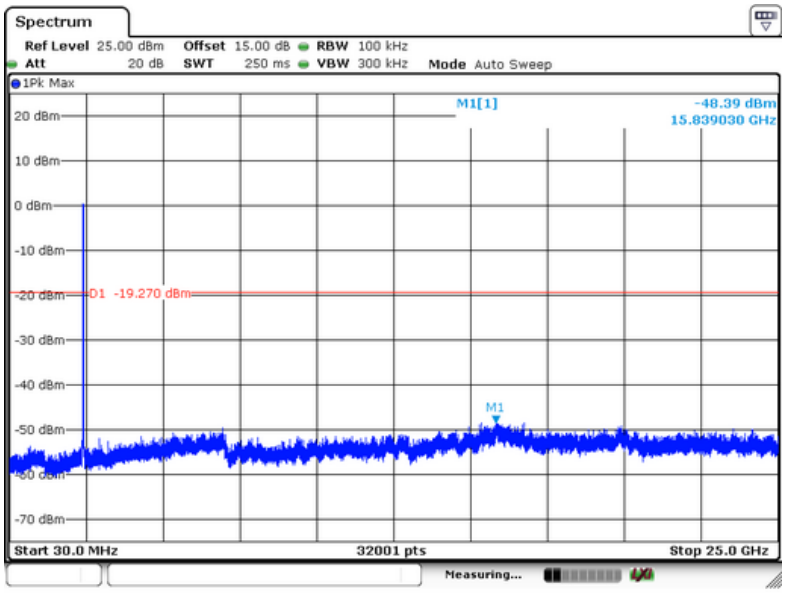


High Channel

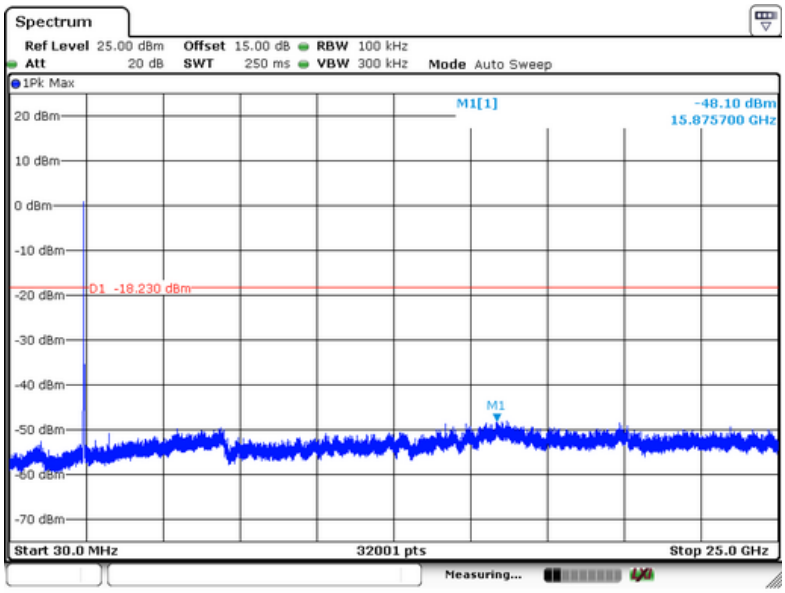


802.11n-HT20

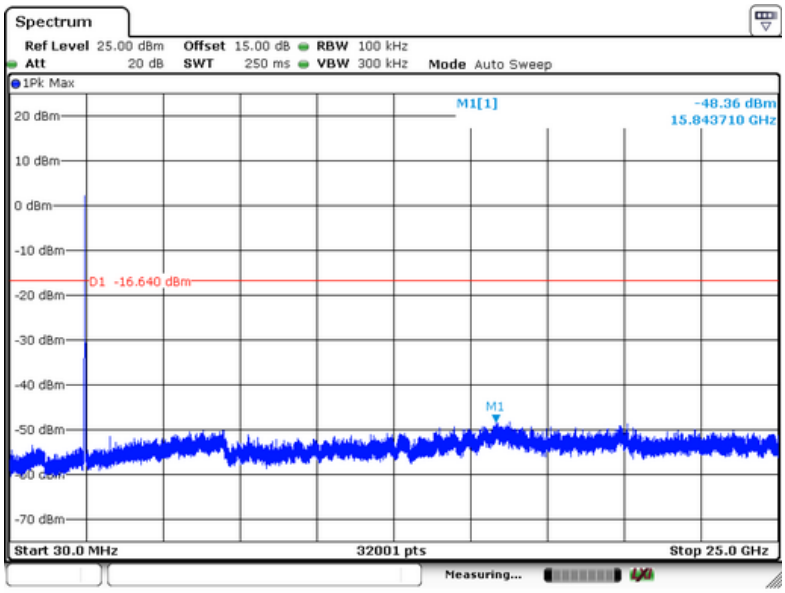
Low Channel



Middle Channel

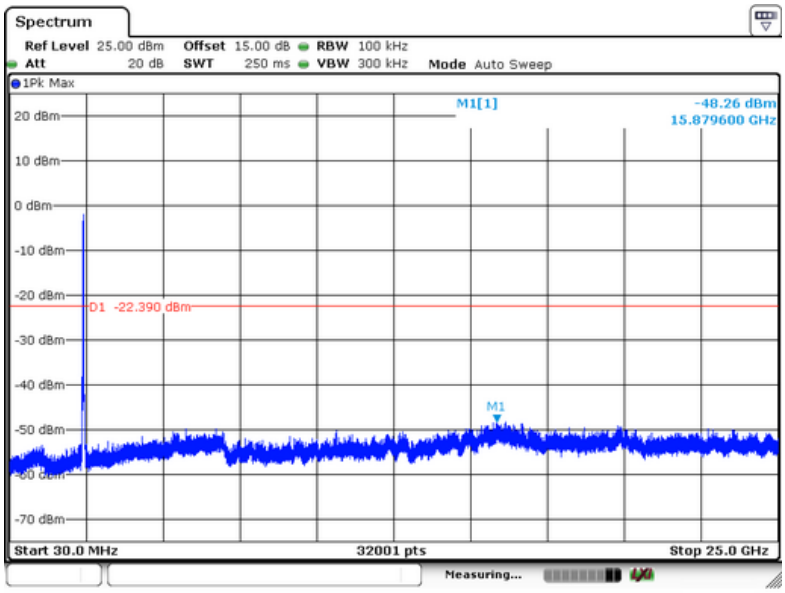


High Channel

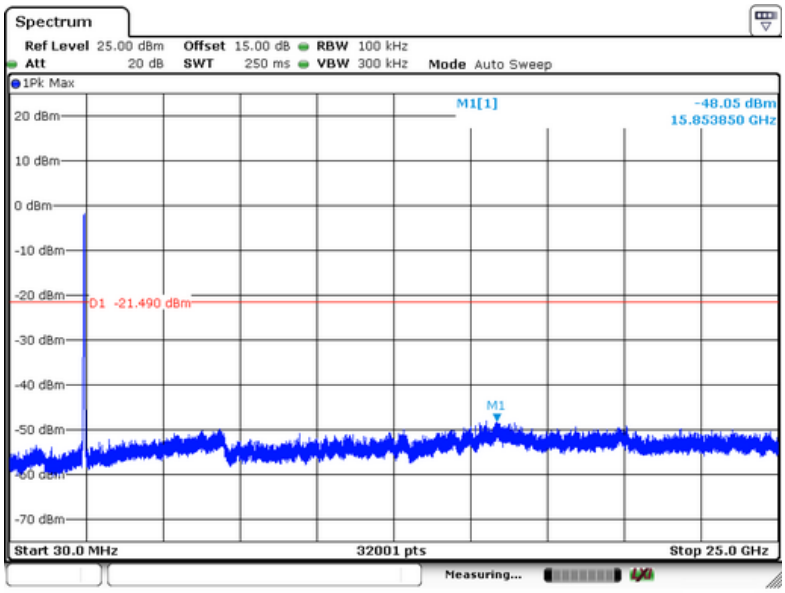


802.11n-HT40

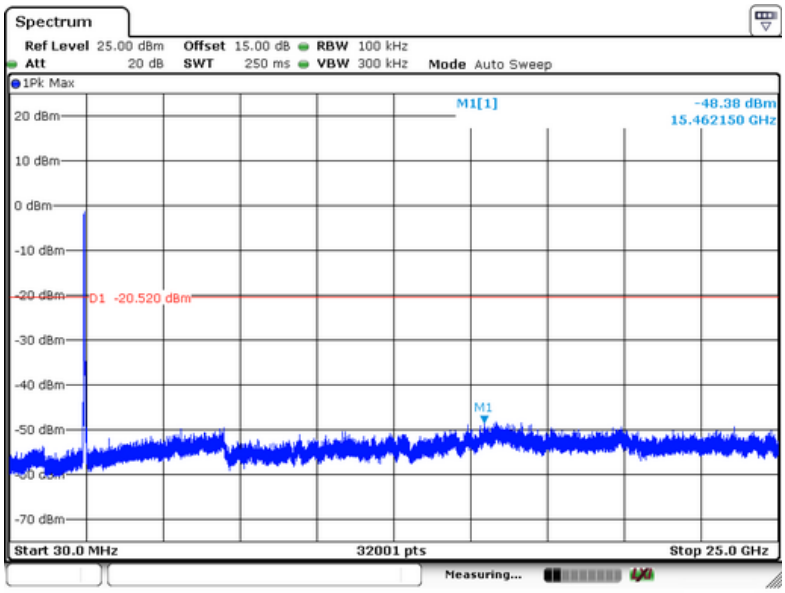
Low Channel



Middle Channel



High Channel



8 Band Edge Measurement

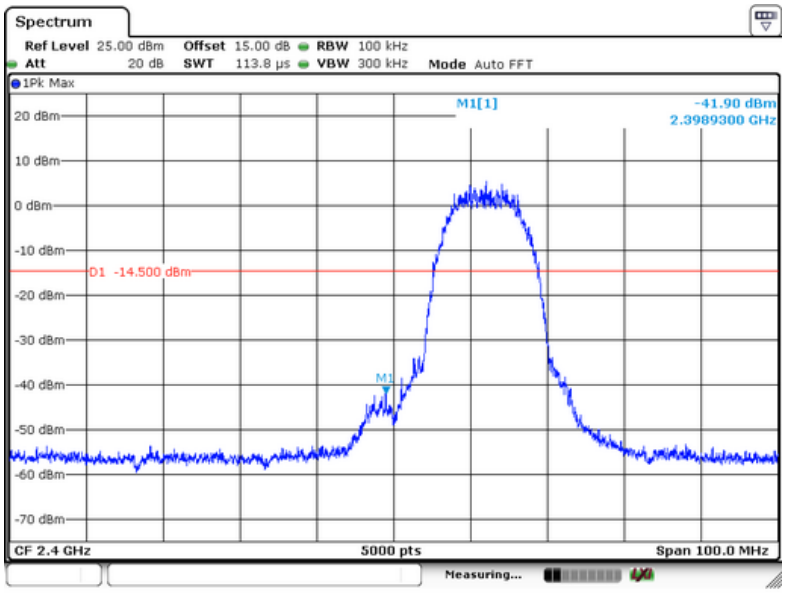
Test Requirement	:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

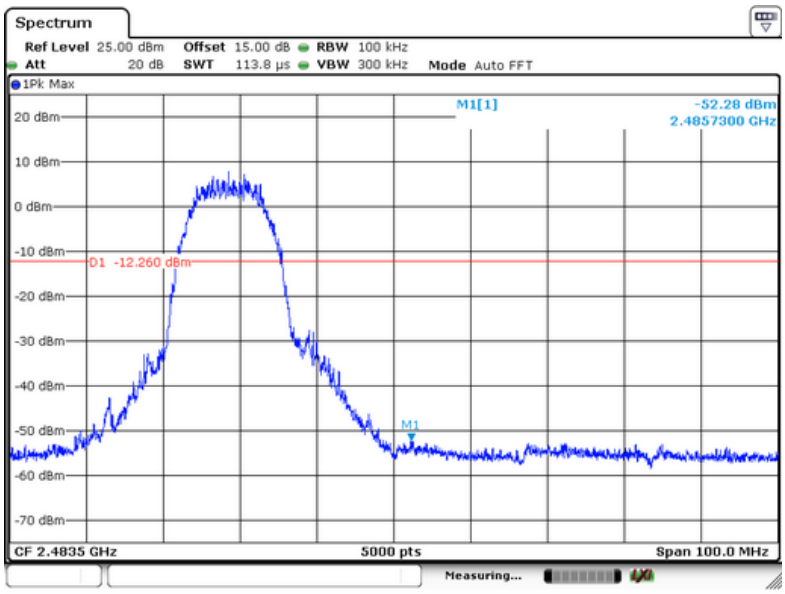
8.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

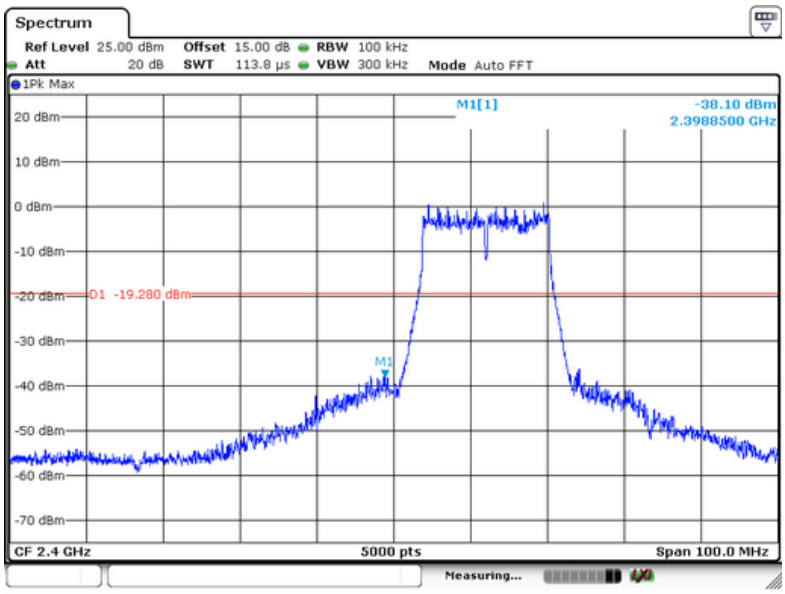
8.2 Test Result

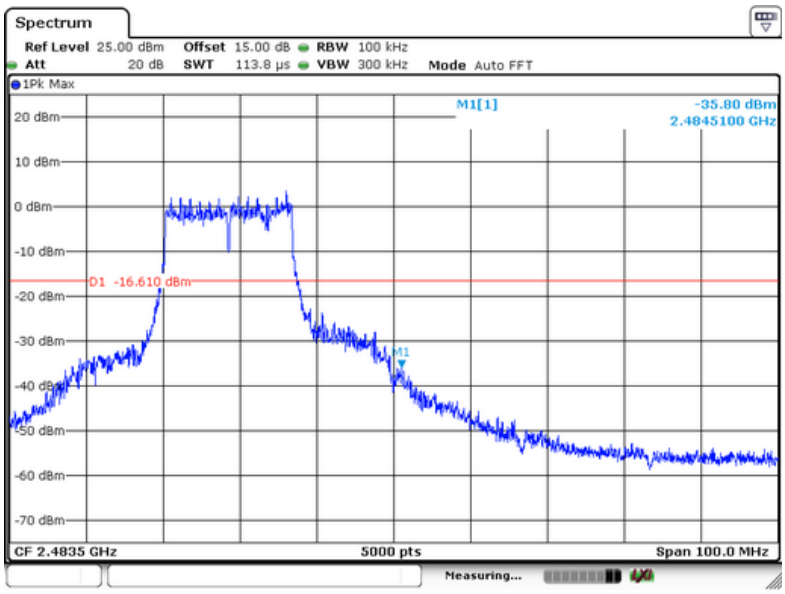
802.11b



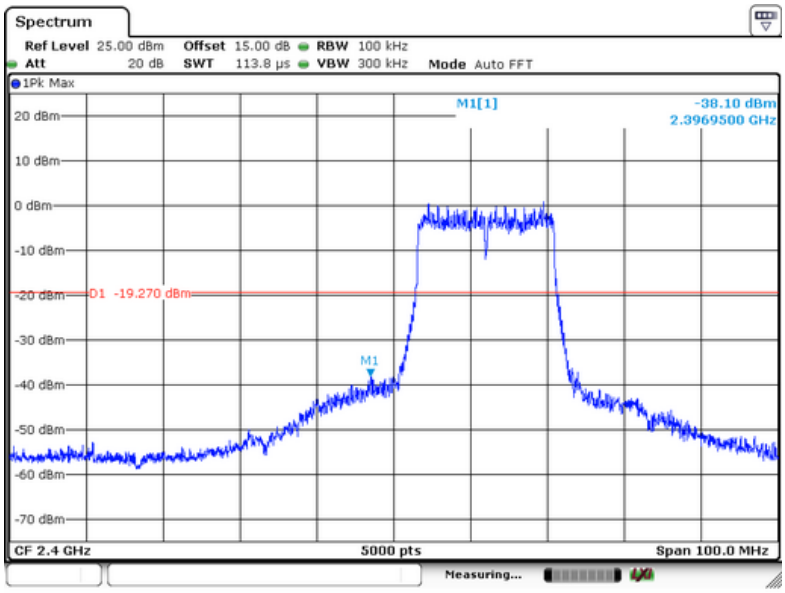


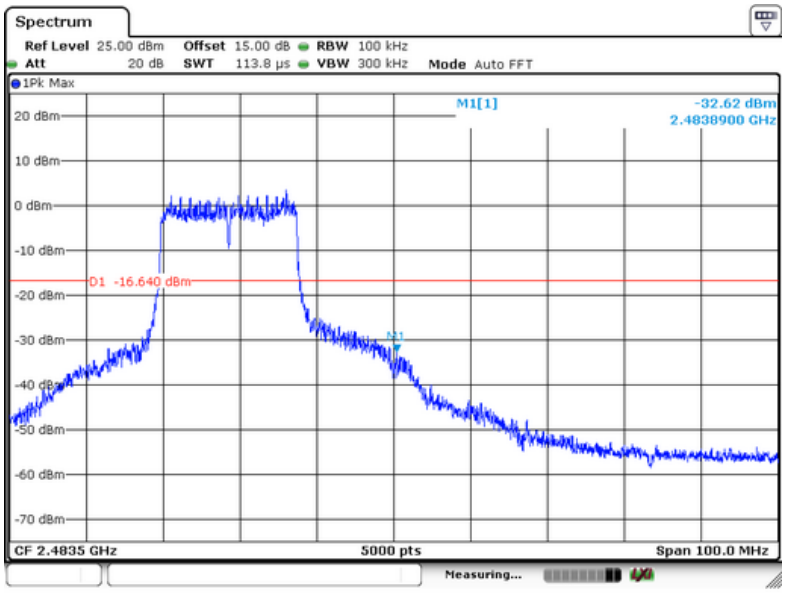
802.11g


Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -38.10 dBm
2.3988500 GHz
D1 -19.280 dBm
CF 2.4 GHz 5000 pts Span 100.0 MHz
Measuring...

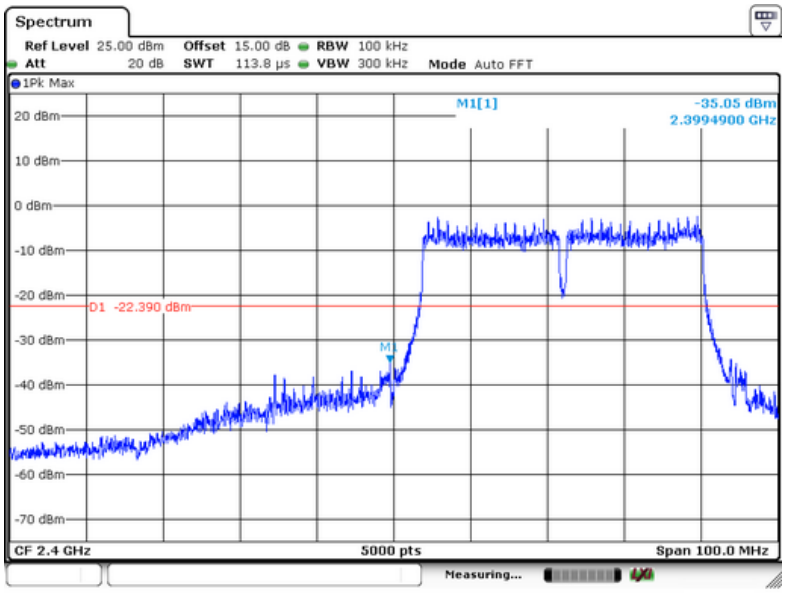

Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -35.80 dBm
2.4845100 GHz
D1 -16.610 dBm
CF 2.4835 GHz 5000 pts Span 100.0 MHz
Measuring...

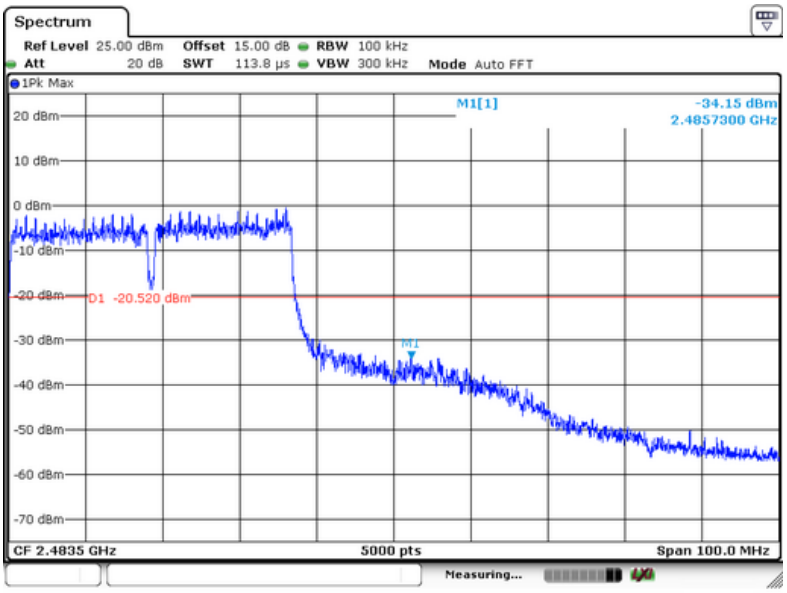
802.11n-HT20


Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -38.10 dBm
2.3969500 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -19.270 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.4 GHz
5000 pts
Span 100.0 MHz
Measuring...


Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -32.62 dBm
2.4838900 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
D1 -16.640 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.4835 GHz
5000 pts
Span 100.0 MHz
Measuring...

802.11n-HT40


Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -35.05 dBm
2.3994900 GHz
D1 -22.390 dBm
CF 2.4 GHz 5000 pts Span 100.0 MHz
Measuring...


Spectrum
Ref Level 25.00 dBm Offset 15.00 dB RBW 100 kHz
Att 20 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -34.15 dBm
2.4857300 GHz
D1 -20.520 dBm
CF 2.4835 GHz 5000 pts Span 100.0 MHz
Measuring...

9 6dB Bandwidth Measurement

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit		Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

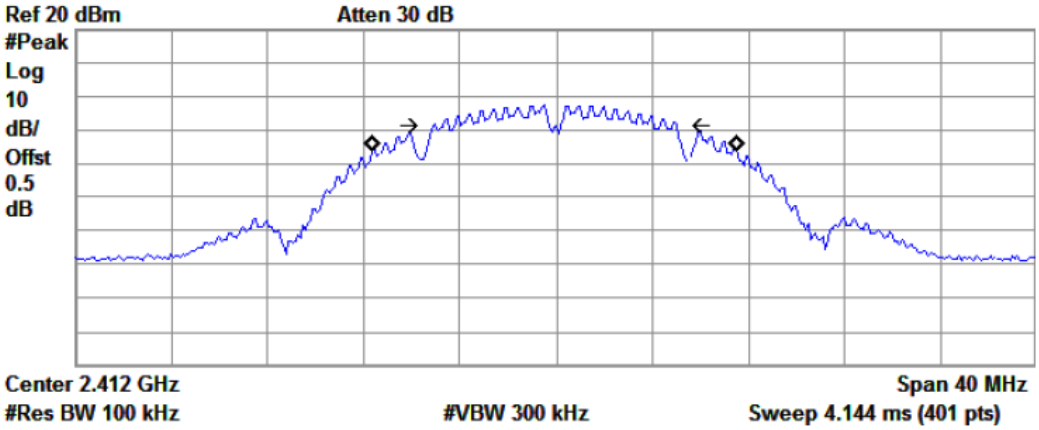
9.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

9.2 Test Result

Modulation	Bandwidth(MHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	10.122	10.151	10.157	≥500kHz
802.11g	16.474	16.455	16.467	≥500kHz
802.11n-HT20	17.671	17.668	17.647	≥500kHz
802.11n-HT40	35.997	35.940	36.357	≥500kHz

802.11b Low Channel

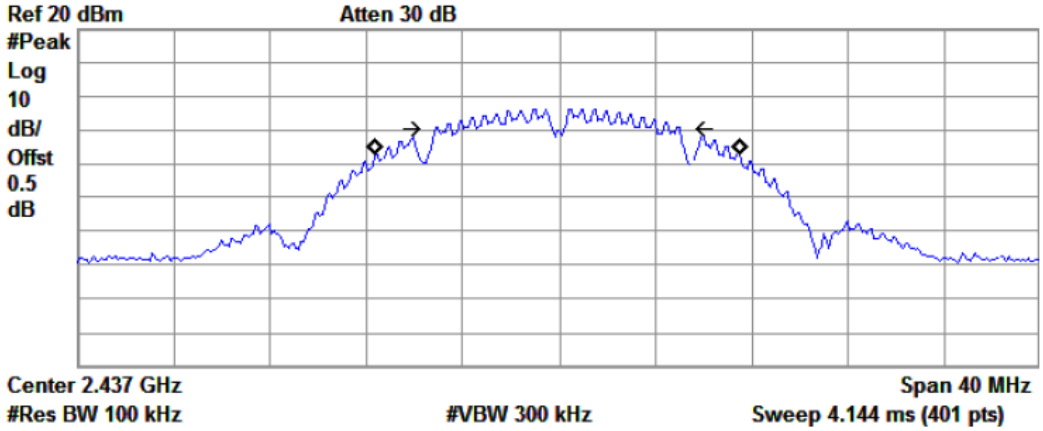


Occupied Bandwidth
15.0966 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -22.899 kHz
x dB Bandwidth 10.122 MHz

802.11b Middle Channel

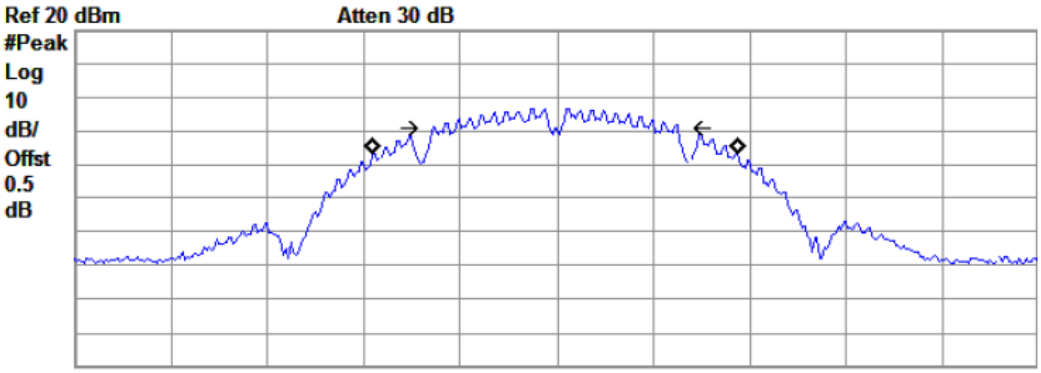


Occupied Bandwidth
15.0887 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -30.104 kHz
x dB Bandwidth 10.151 MHz

802.11b High Channel

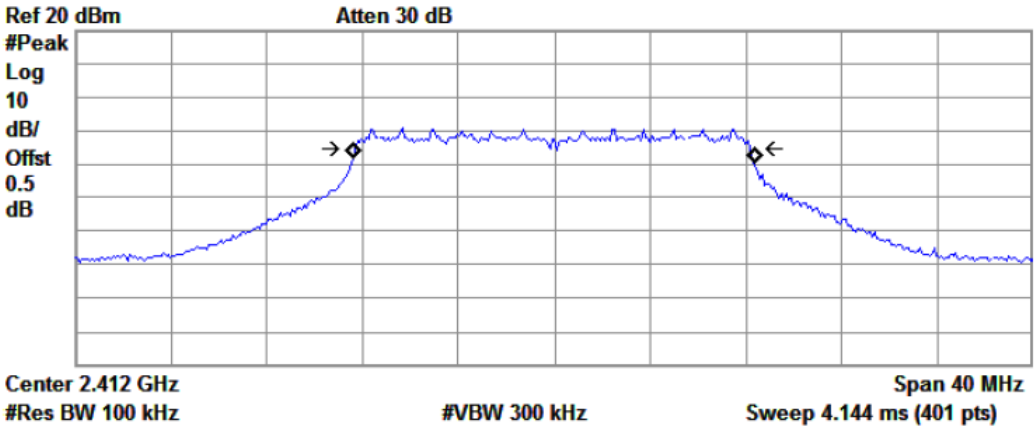


Occupied Bandwidth
15.0771 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -31.157 kHz
x dB Bandwidth 10.157 MHz

802.11g Low Channel

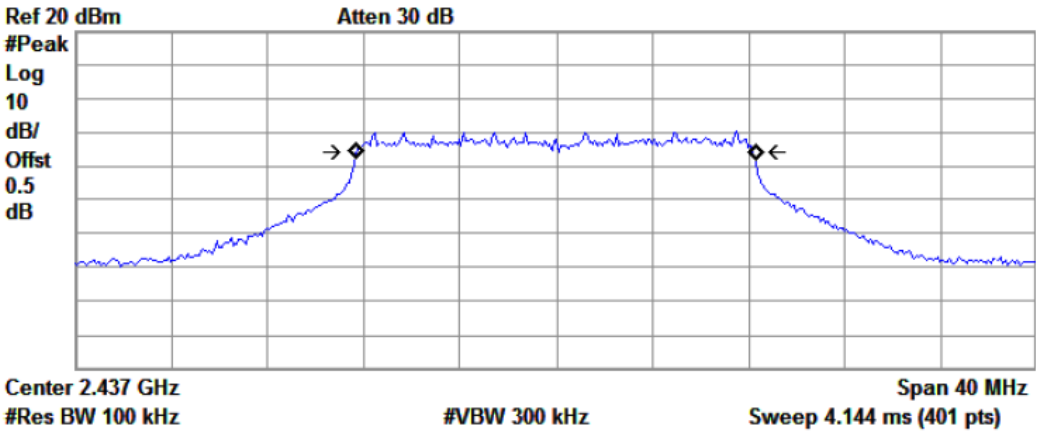


Occupied Bandwidth
16.7537 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -22.289 kHz
x dB Bandwidth 16.474 MHz

802.11g Middle Channel

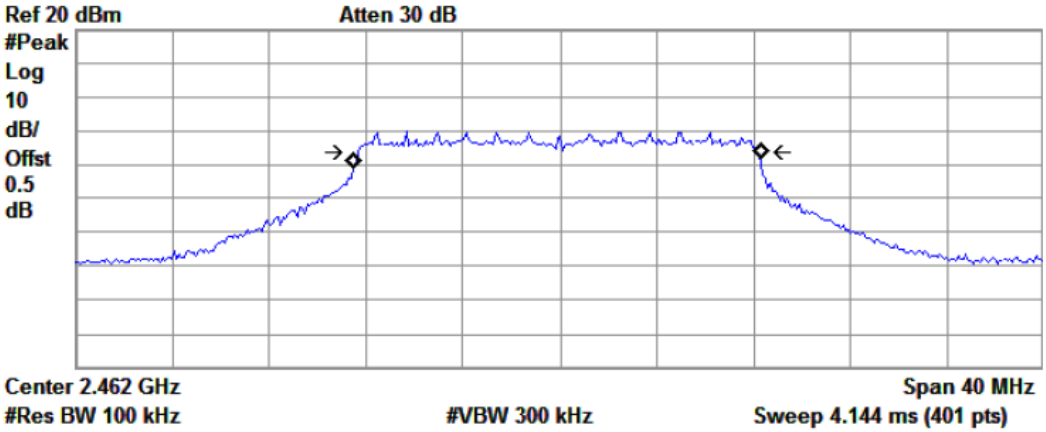


Occupied Bandwidth
16.6082 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -35.581 kHz
x dB Bandwidth 16.455 MHz

802.11g High Channel

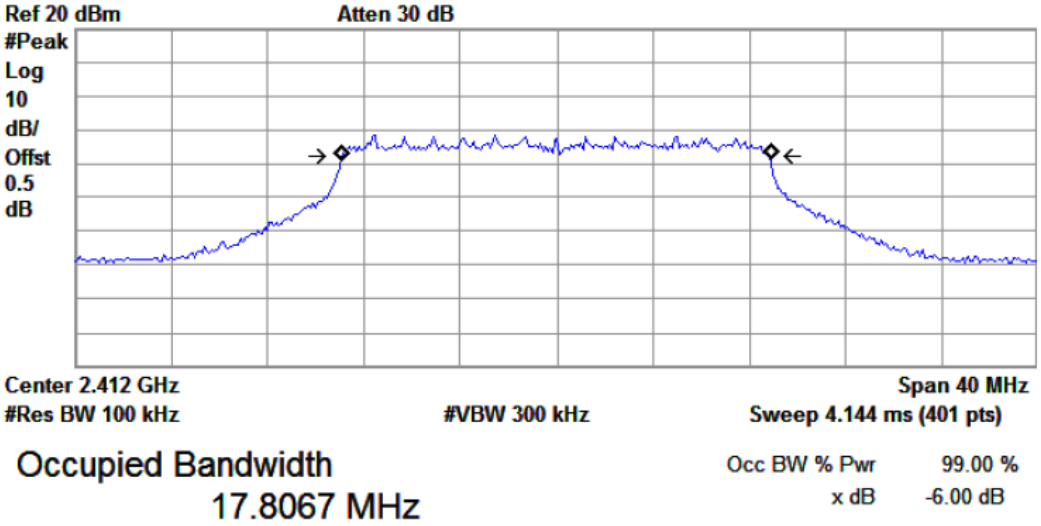


Occupied Bandwidth
16.7688 MHz

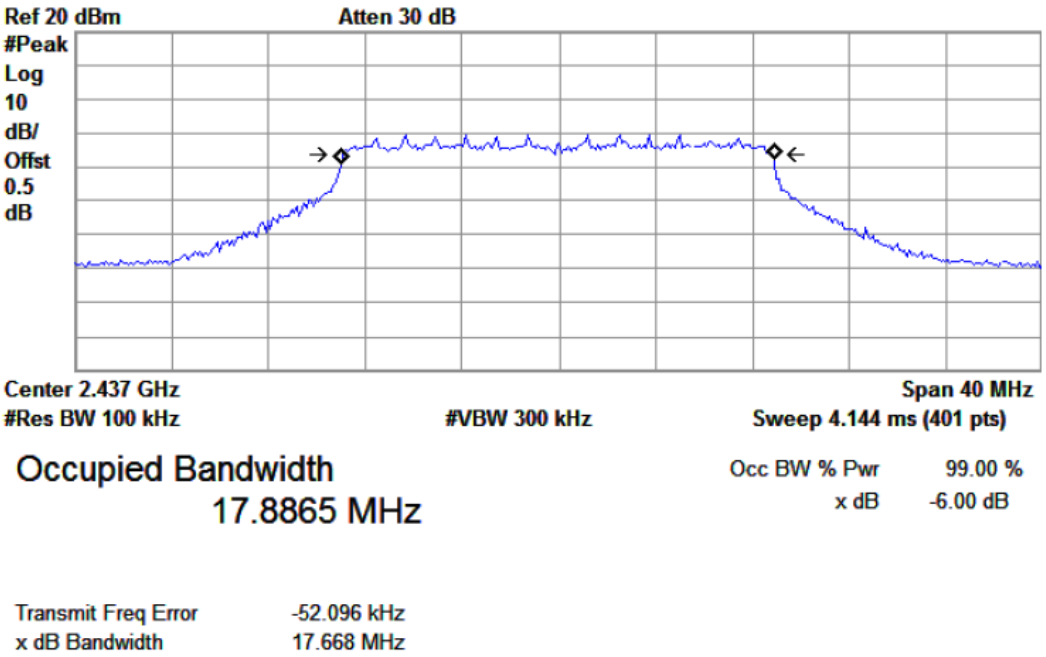
Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -122.052 kHz
x dB Bandwidth 16.467 MHz

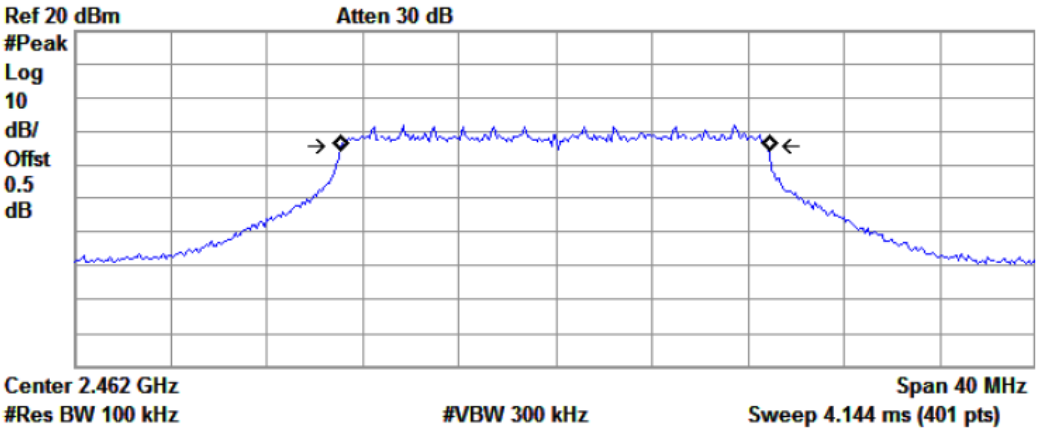
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel



802.11n-HT20 High Channel

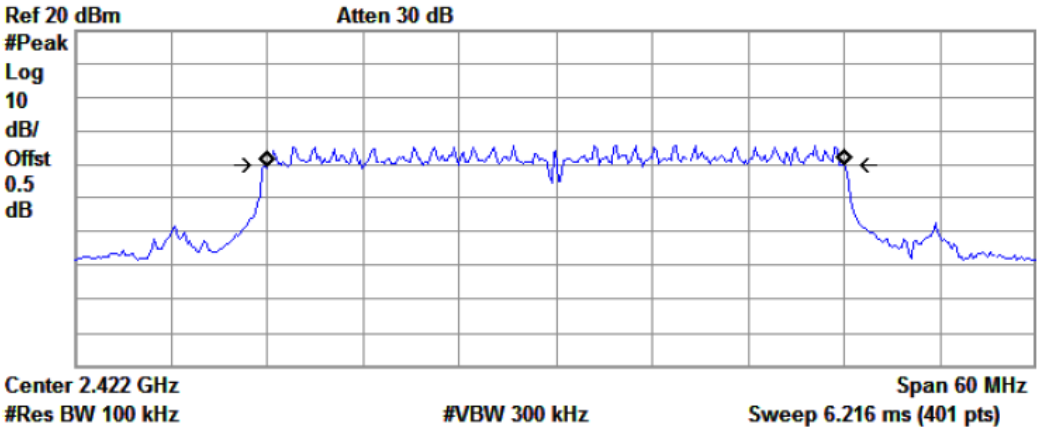


Occupied Bandwidth
17.7850 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -34.562 kHz
x dB Bandwidth 17.647 MHz

802.11n-HT40 Low Channel

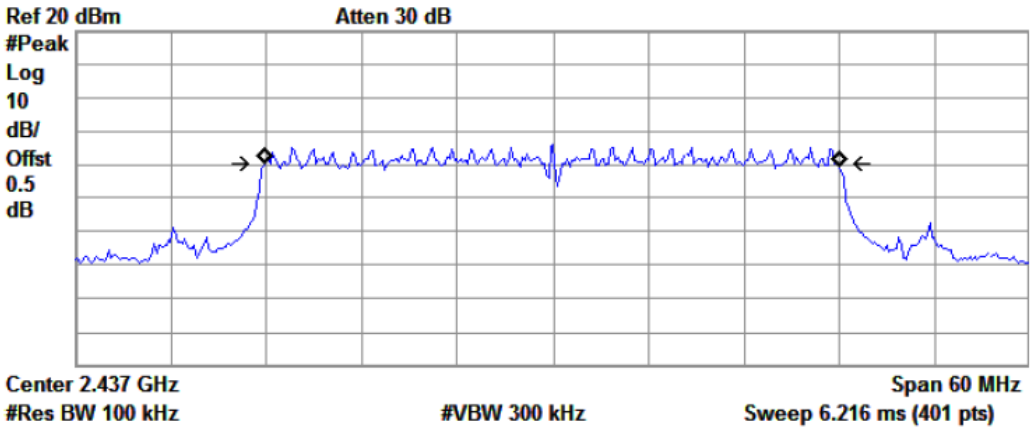


Occupied Bandwidth
36.0391 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -45.623 kHz
x dB Bandwidth 35.997 MHz

802.11n-HT40 Middle Channel

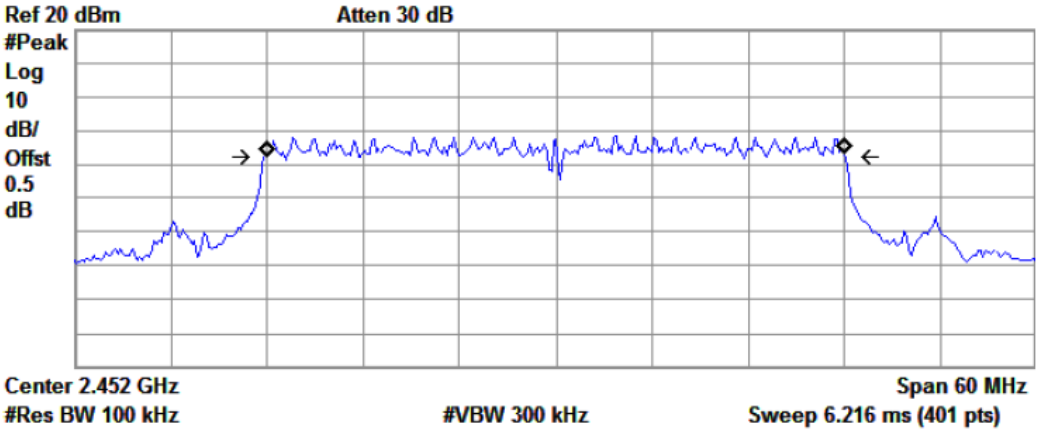


Occupied Bandwidth
36.0858 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -53.566 kHz
x dB Bandwidth 35.940 MHz

802.11n-HT40 High Channel



Occupied Bandwidth
36.0002 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -35.950 kHz
x dB Bandwidth 36.357 MHz

10 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

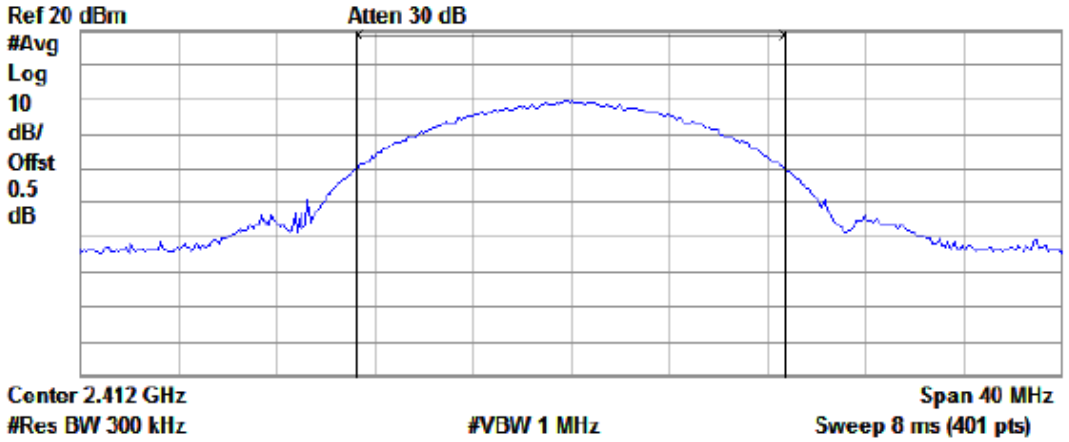
10.1 Test Procedure

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

10.2 Test Result

Modulation	Maximum Peak Output Power (dBm)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	7.27	8.41	8.09	1W(30dBm)
802.11g	7.95	8.58	7.44	1W(30dBm)
802.11n-HT20	9.15	8.63	8.49	1W(30dBm)
802.11n-HT40	8.46	8.61	8.67	1W(30dBm)

802.11b Low Channel



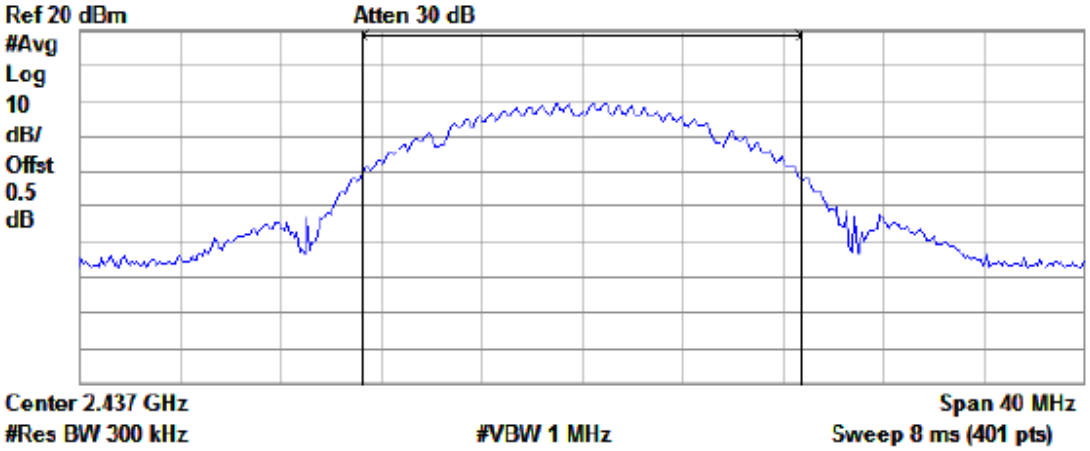
Channel Power

7.27 dBm / 17.3590 MHz

Power Spectral Density

-65.13 dBm/Hz

802.11b Middle Channel



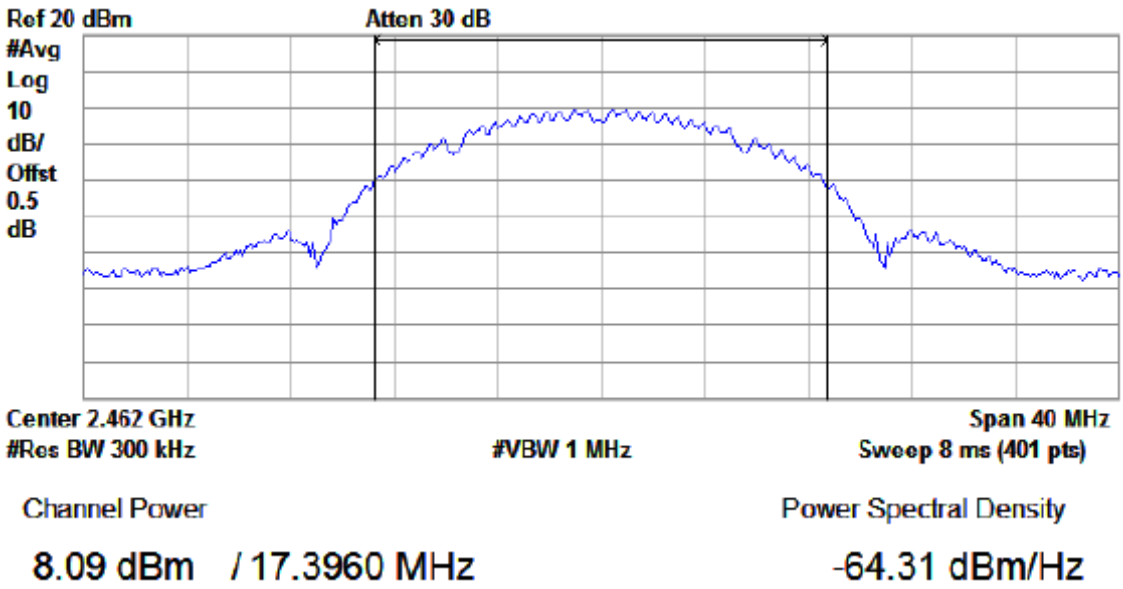
Channel Power

8.41 dBm / 17.4080 MHz

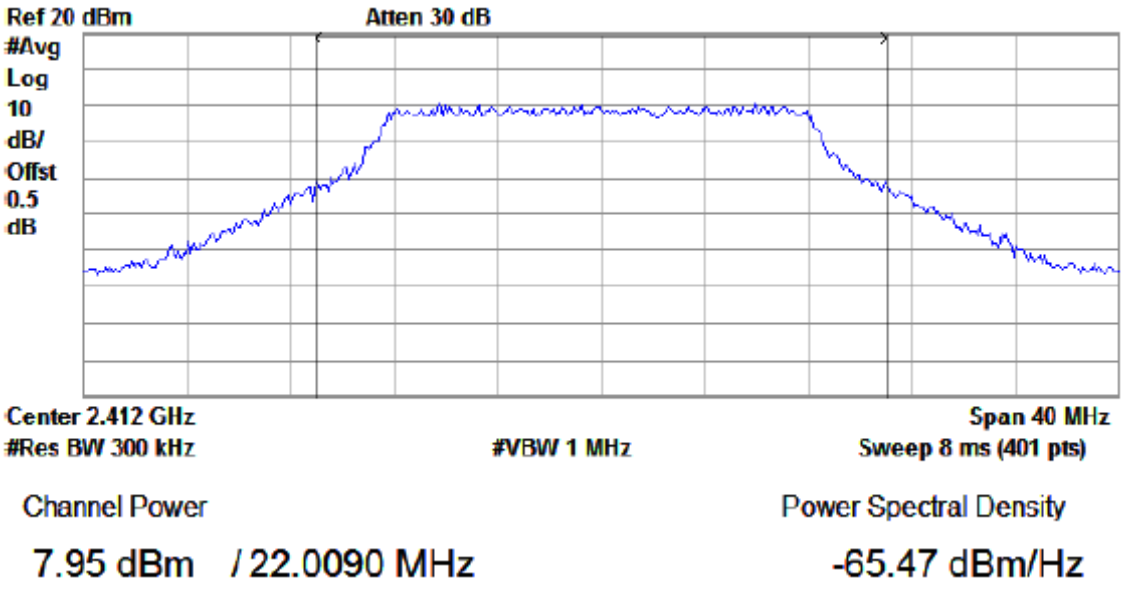
Power Spectral Density

-63.99 dBm/Hz

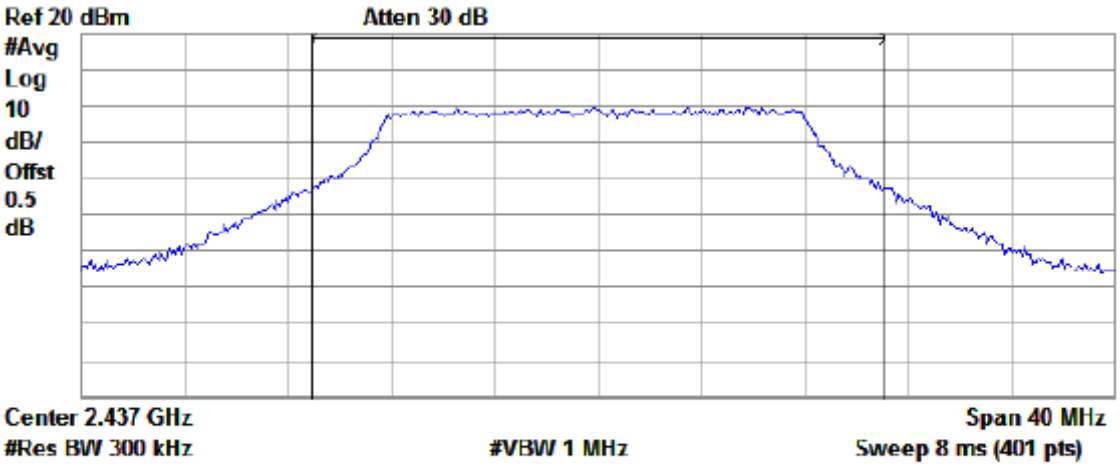
802.11b High Channel



802.11g Low Channel



802.11g Middle Channel



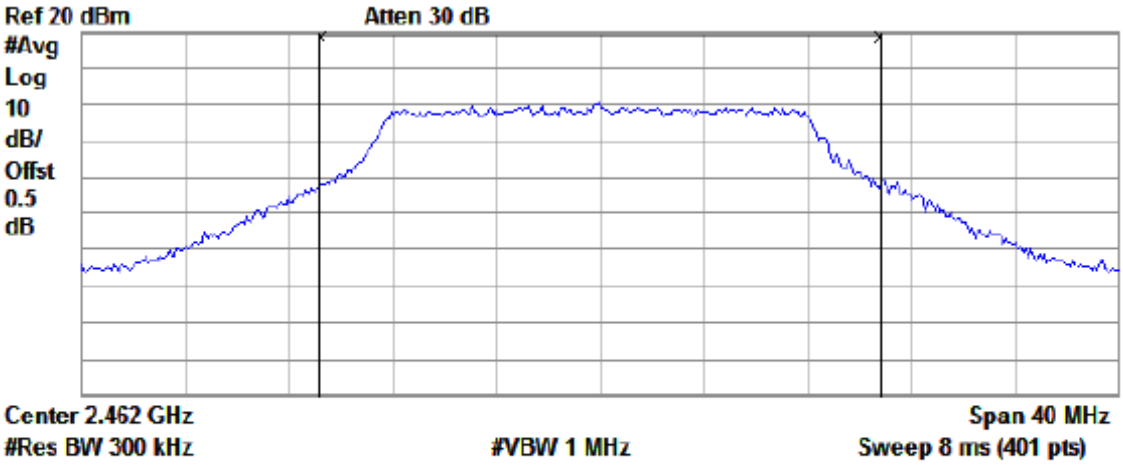
Channel Power

8.58 dBm / 22.0890 MHz

Power Spectral Density

-64.86 dBm/Hz

802.11g High Channel



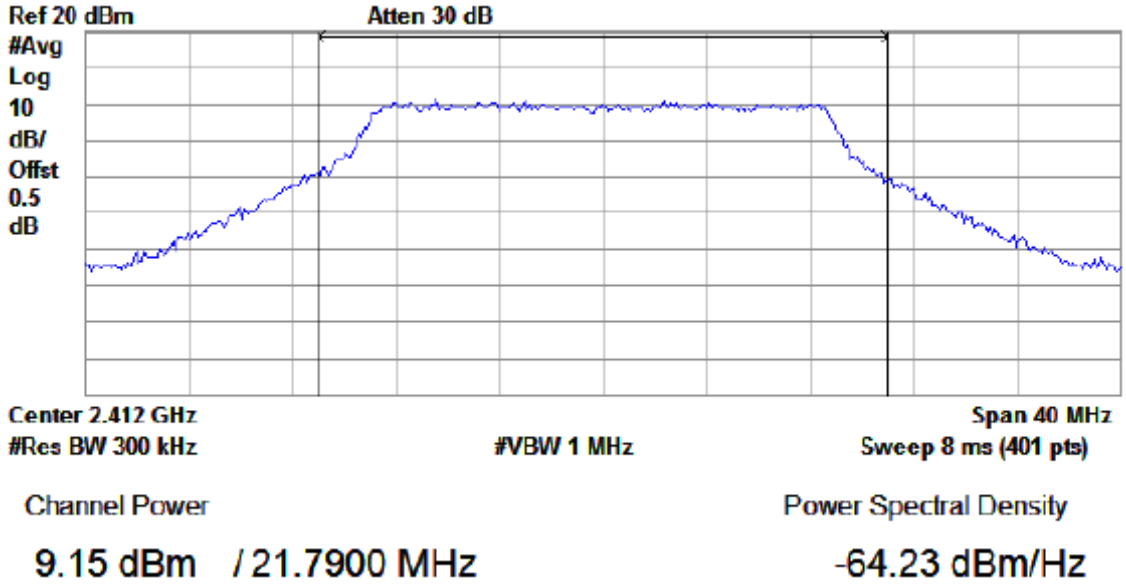
Channel Power

7.44 dBm / 21.4960 MHz

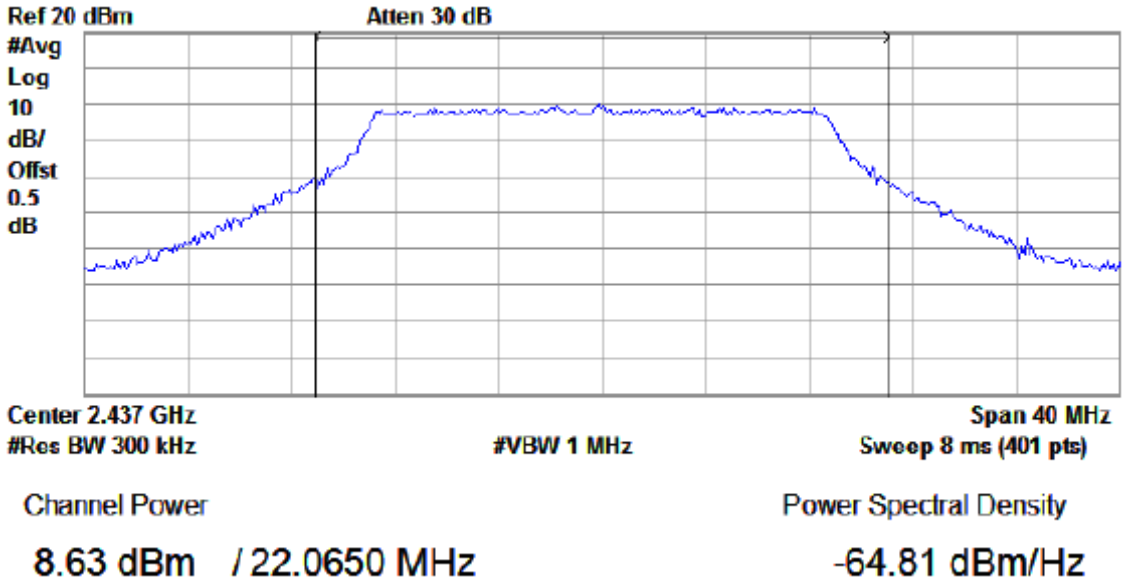
Power Spectral Density

-65.89 dBm/Hz

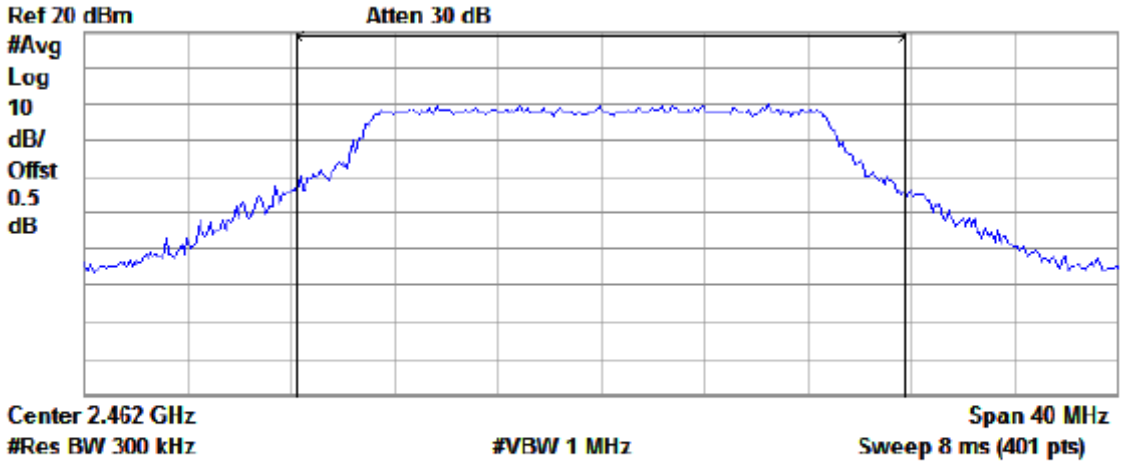
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel



802.11n-HT20 High Channel



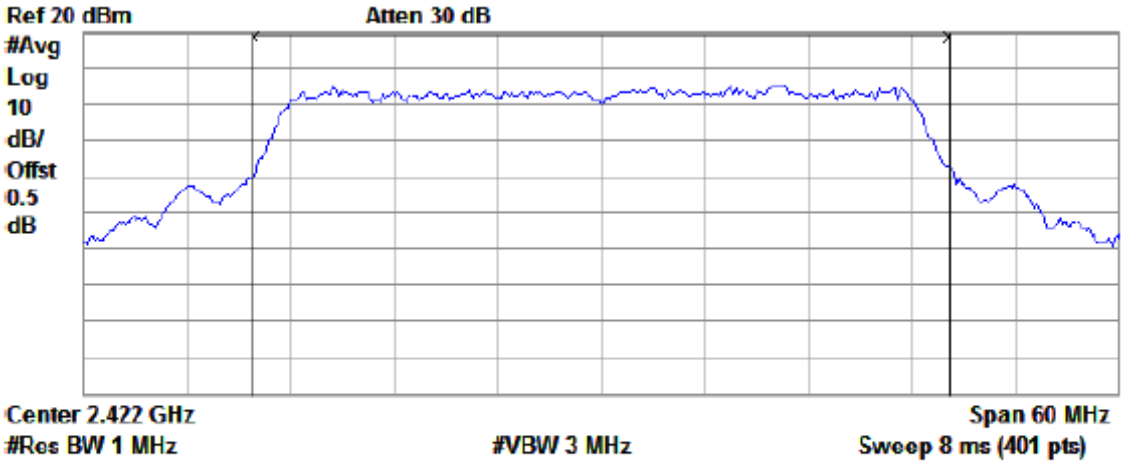
Channel Power

8.49 dBm / 23.3670 MHz

Power Spectral Density

-65.20 dBm/Hz

802.11n-HT40 Low Channel



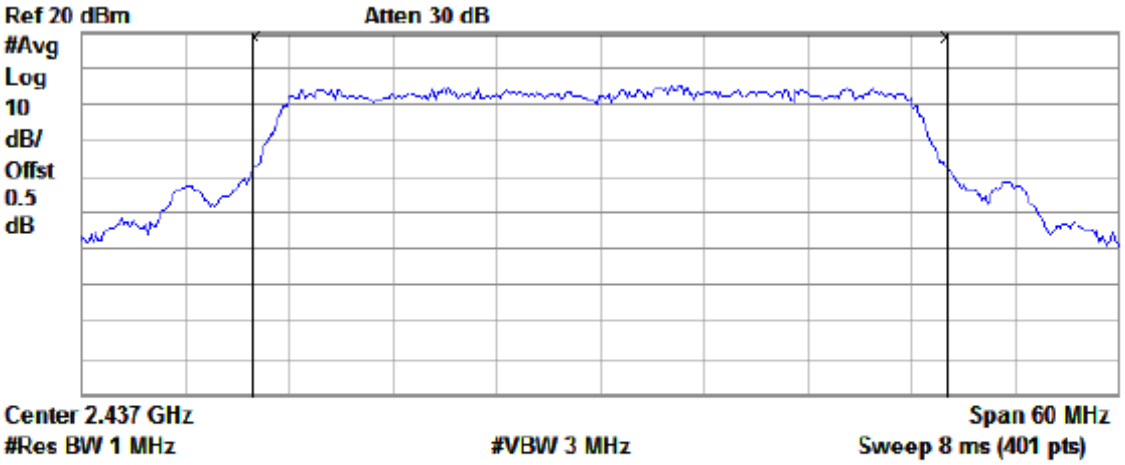
Channel Power

8.46 dBm / 40.1780 MHz

Power Spectral Density

-67.58 dBm/Hz

802.11n-HT40 Middle Channel



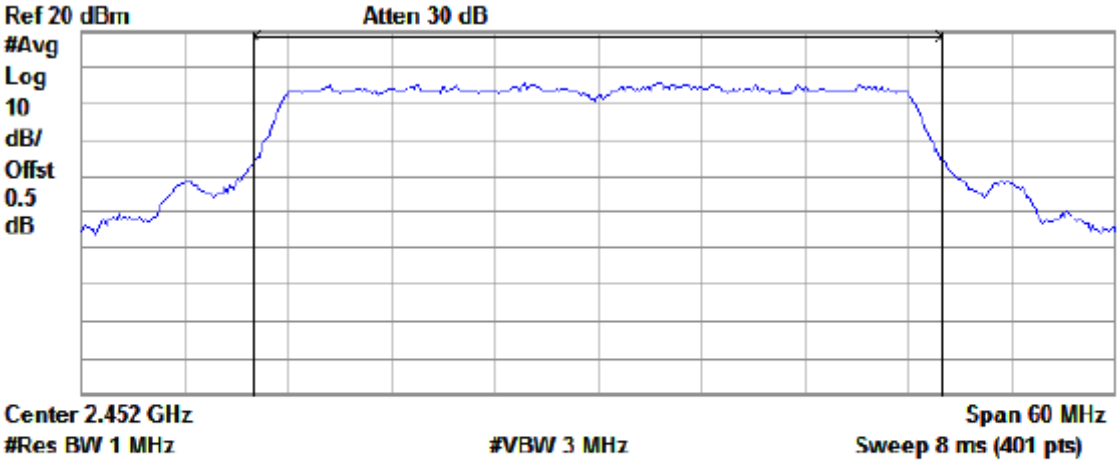
Channel Power

8.61 dBm / 40.0580 MHz

Power Spectral Density

-67.12 dBm/Hz

802.11n-HT40 High Channel



Channel Power

8.67 dBm / 39.6990 MHz

Power Spectral Density

-67.32 dBm/Hz

11 Power Spectral density

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

Test Limit : Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

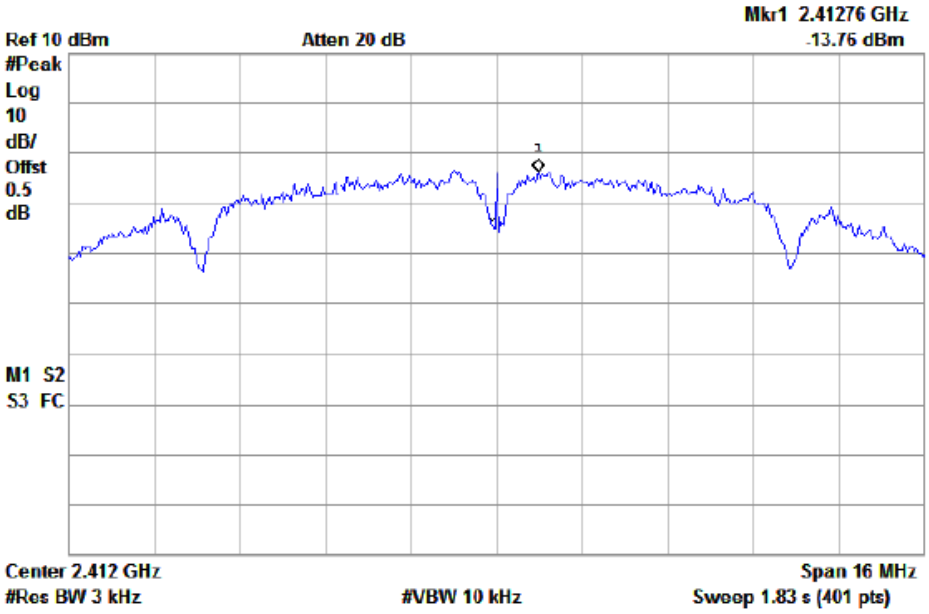
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz, Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

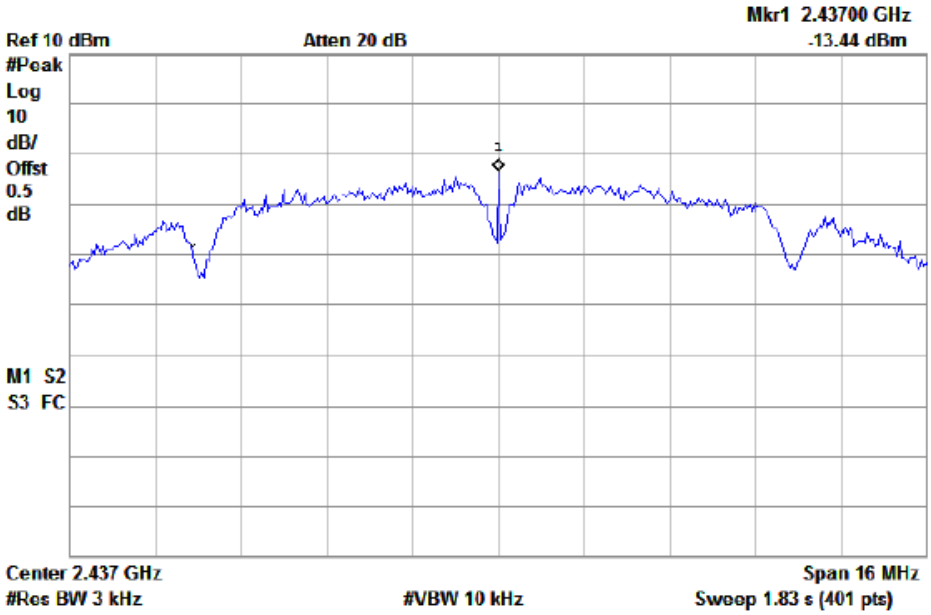
11.2 Test Result

Modulation	Power Spectral density (dBm/3kHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	-13.76	-13.44	-12.29	8dBm/3kHz
802.11g	-7.253	-13.27	-12.95	8dBm/3kHz
802.11n-HT20	-13.52	-7.095	-12.88	8dBm/3kHz
802.11n-HT40	-16.11	-16.09	-16.84	8dBm/3kHz

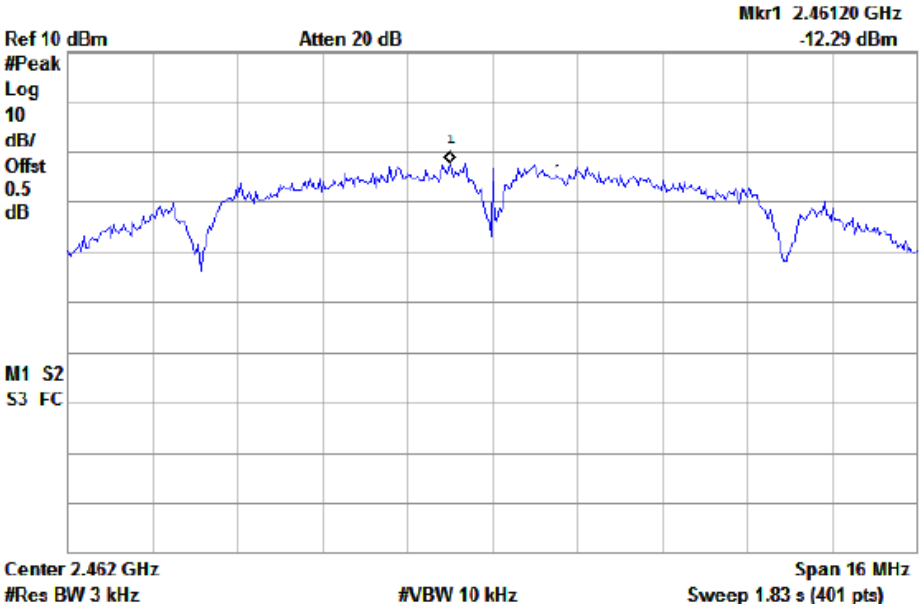
802.11b Low Channel



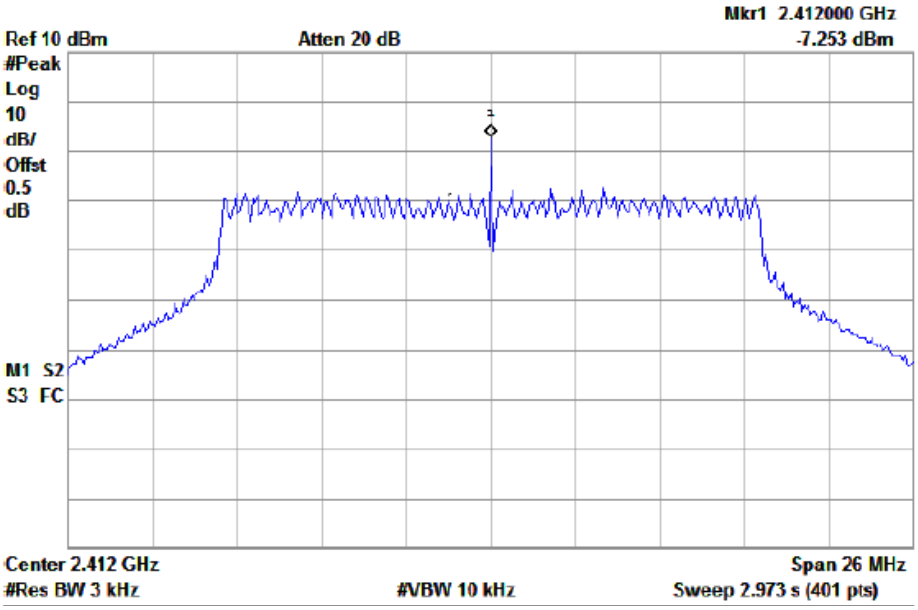
802.11b Middle Channel



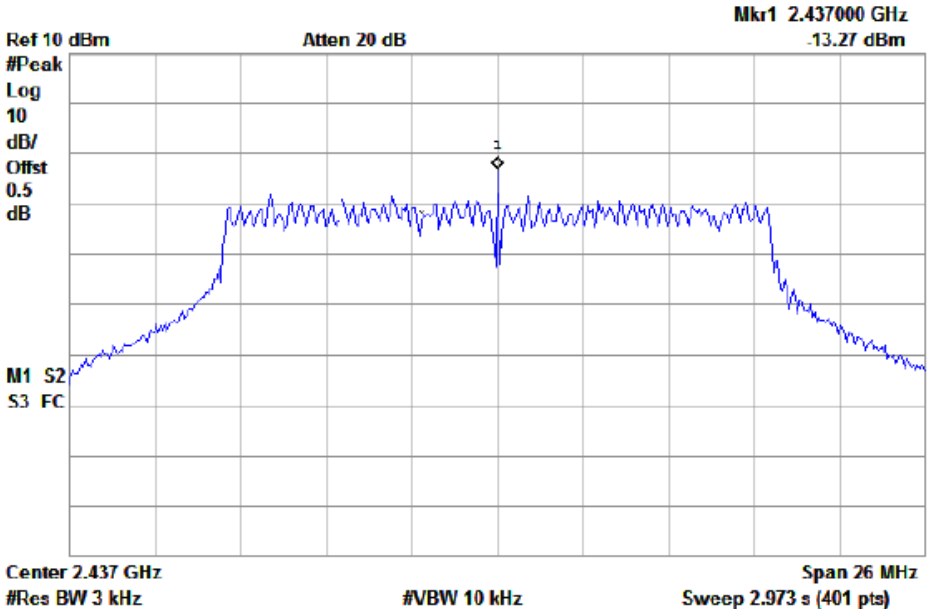
802.11b High Channel



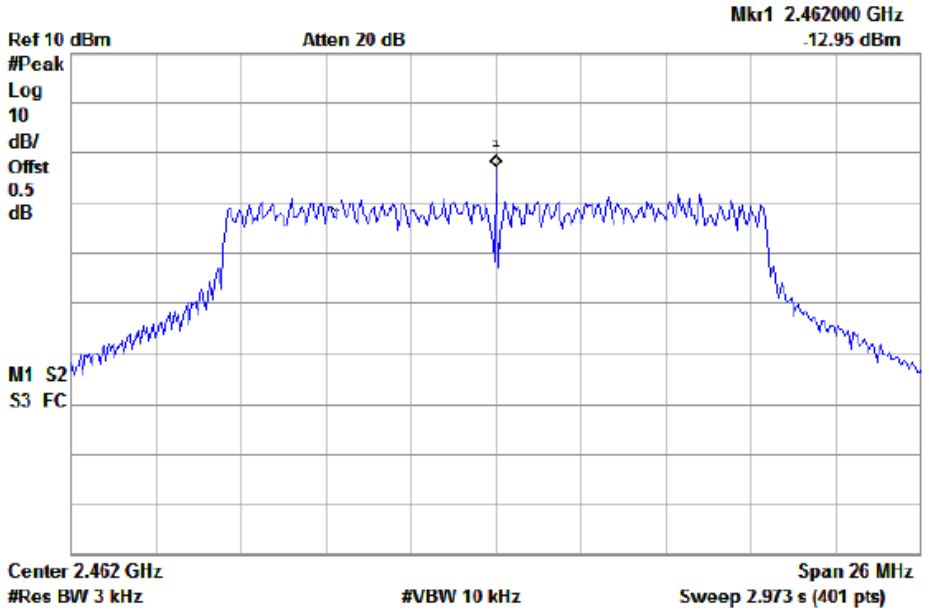
802.11g Low Channel



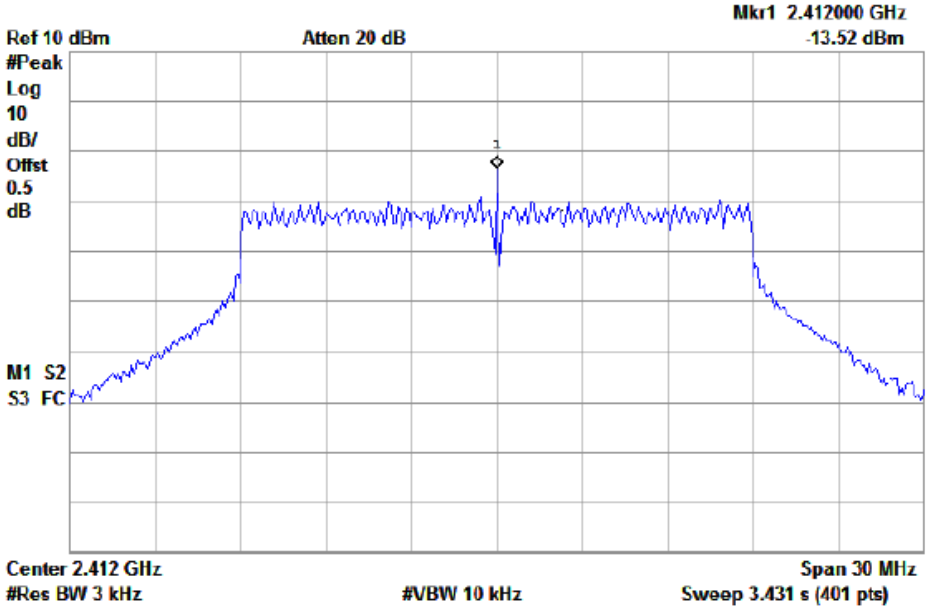
802.11g Middle Channel



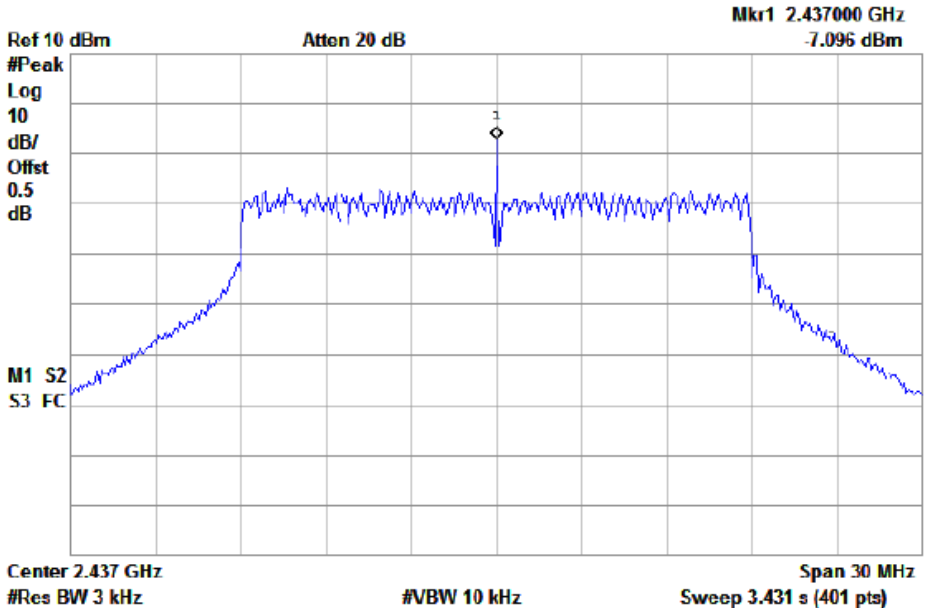
802.11g High Channel



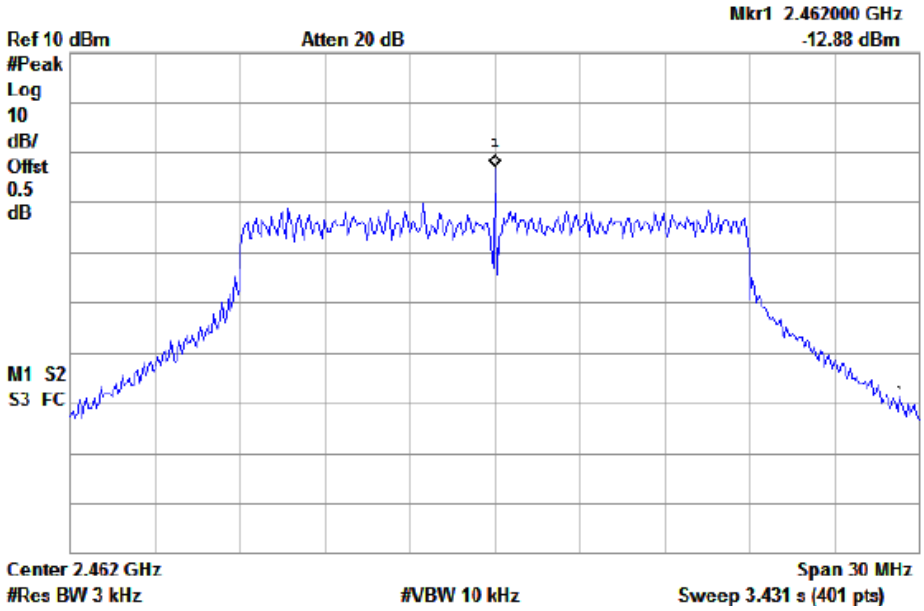
802.11n-HT20 Low Channel



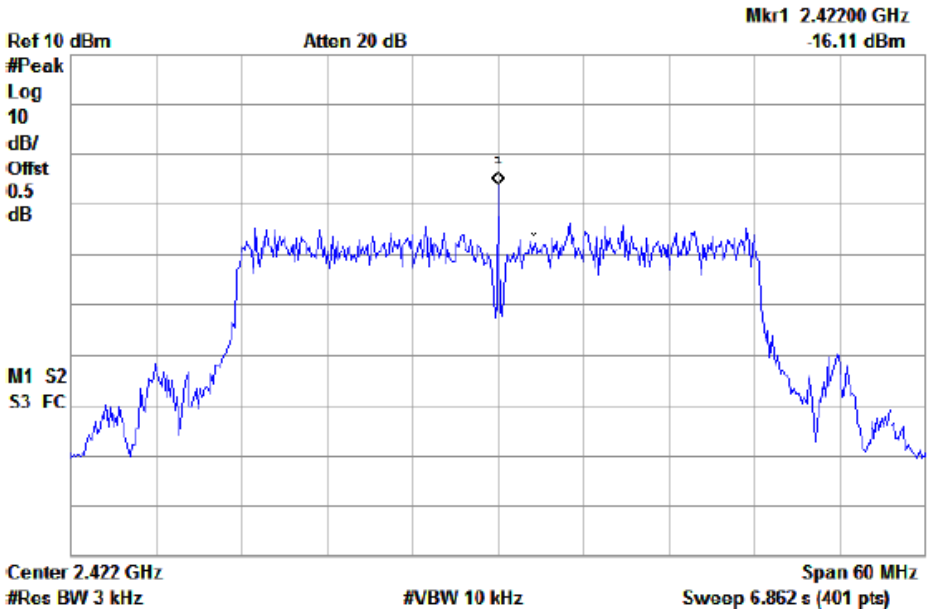
802.11n-HT20 Middle Channel



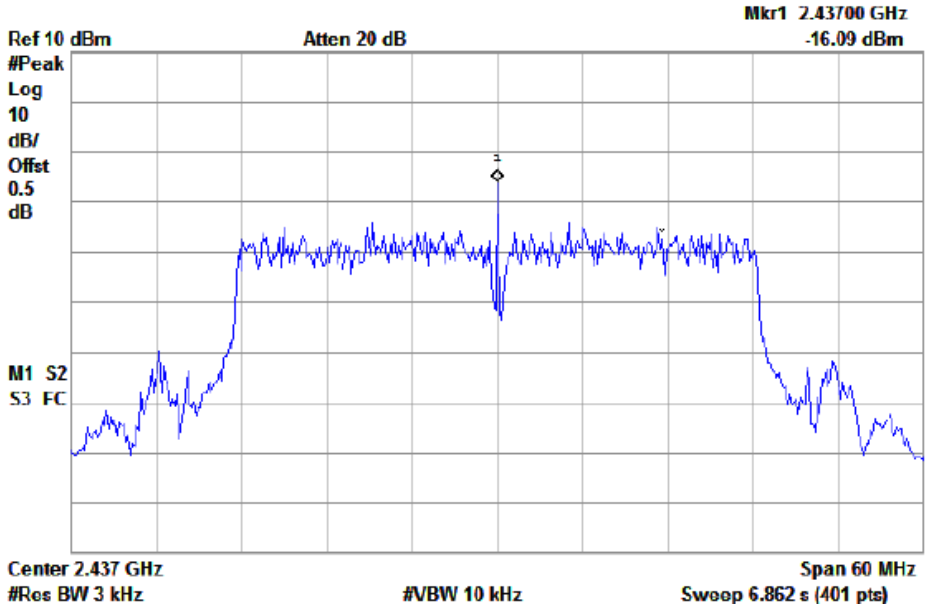
802.11n-HT20 High Channel



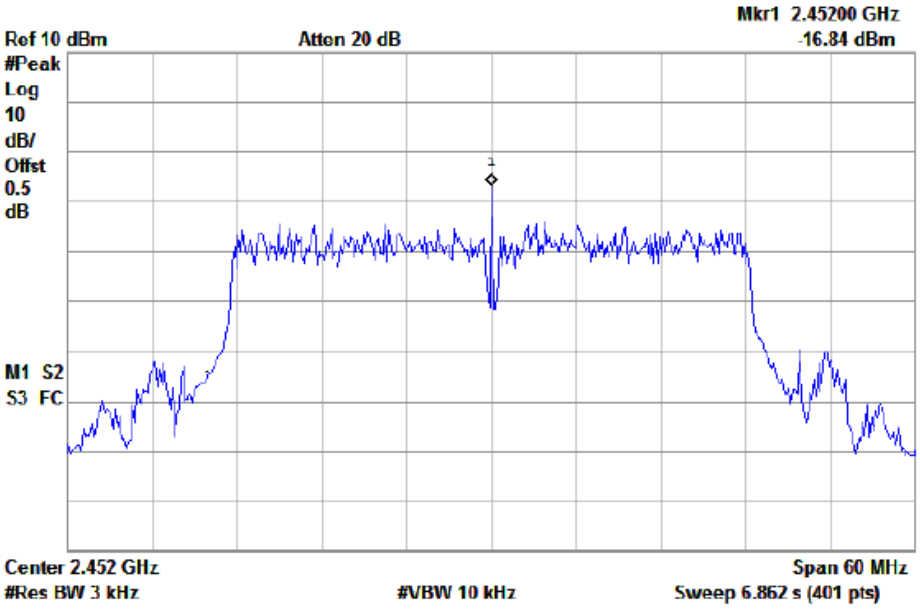
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



12 Antenna Application

12.1 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.

12.2 Result

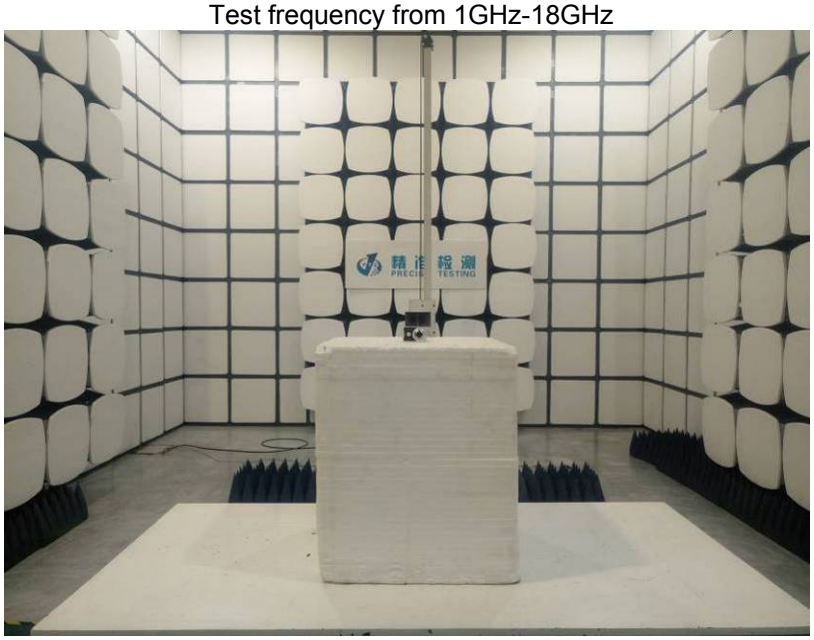
The EUT'S antenna, permanent attached antenna, is internal PCB antenna. The antenna's gain is 2dBi and meets the requirement.

13 Test Setup

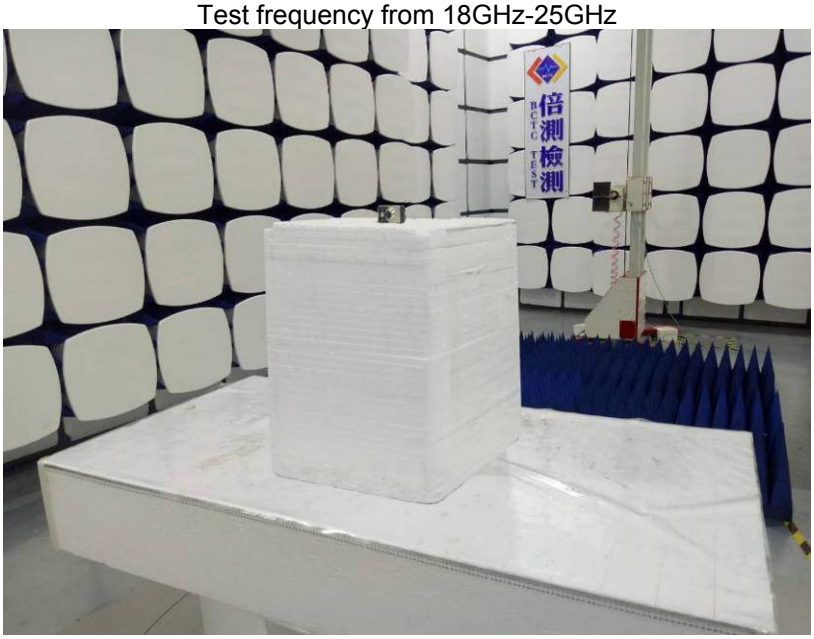
Conducted Emissions

Radiated Spurious Emissions
From 30MHz-1000MHz

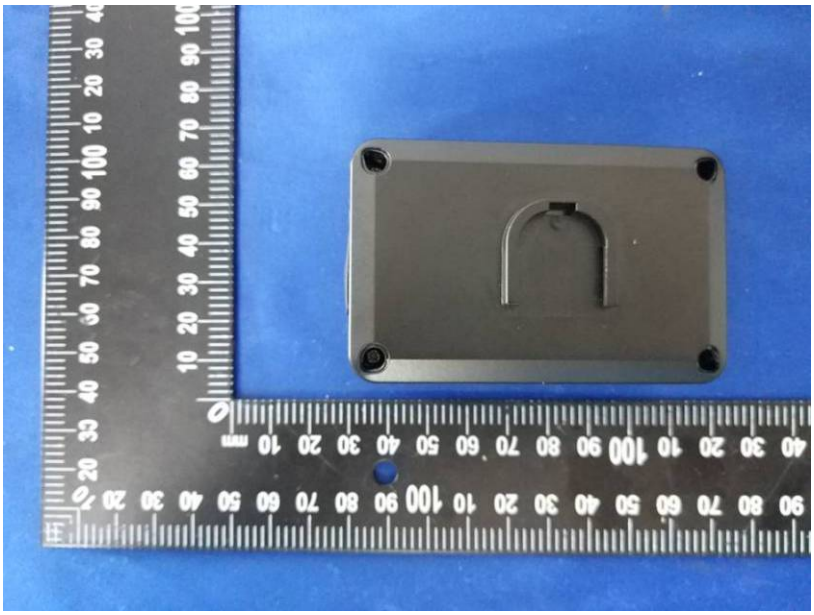
Test frequency from 1GHz-18GHz

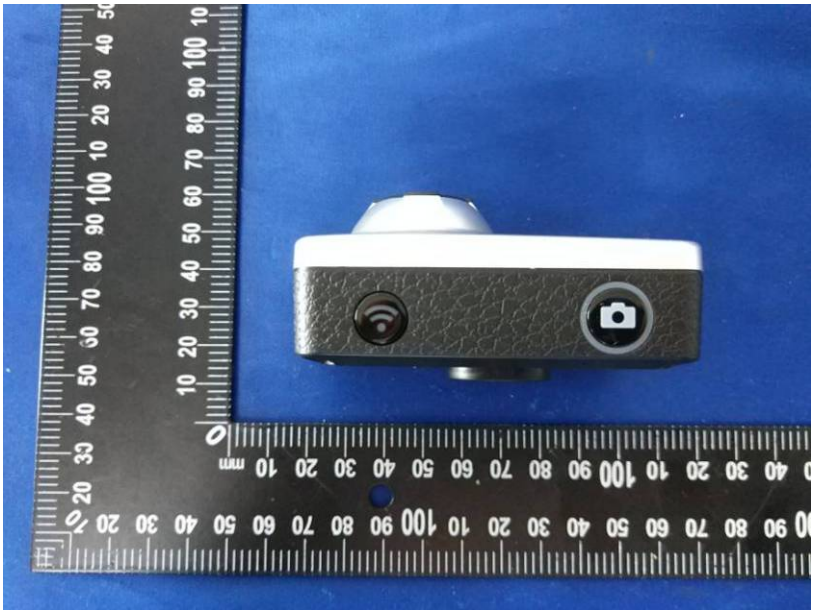


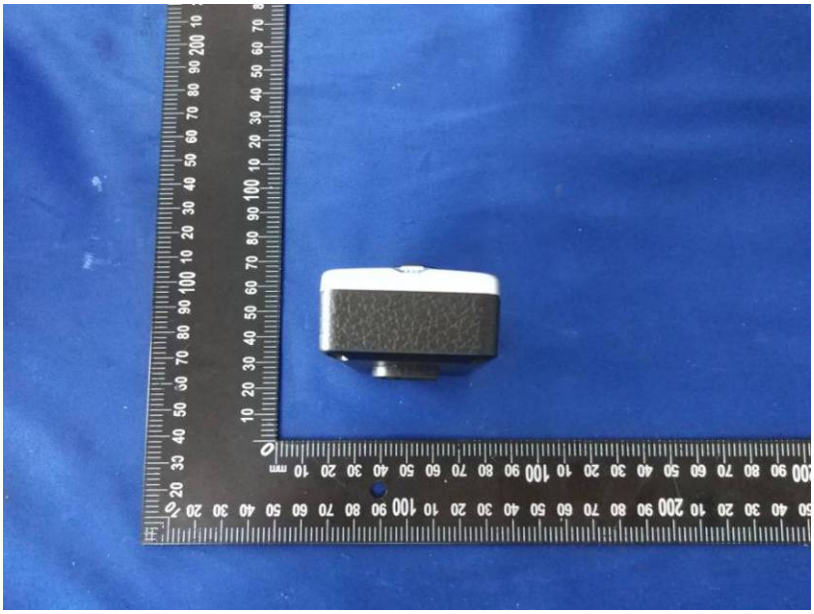
Test frequency from 18GHz-25GHz

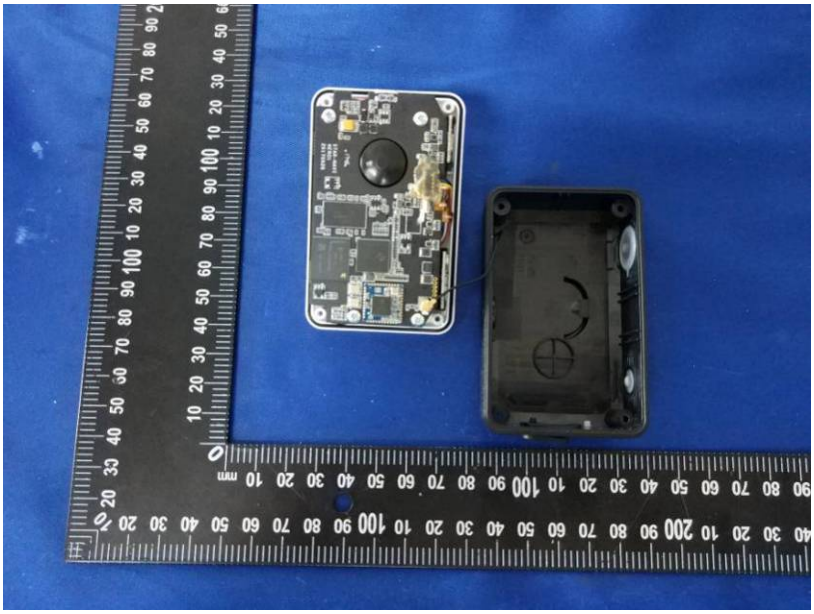


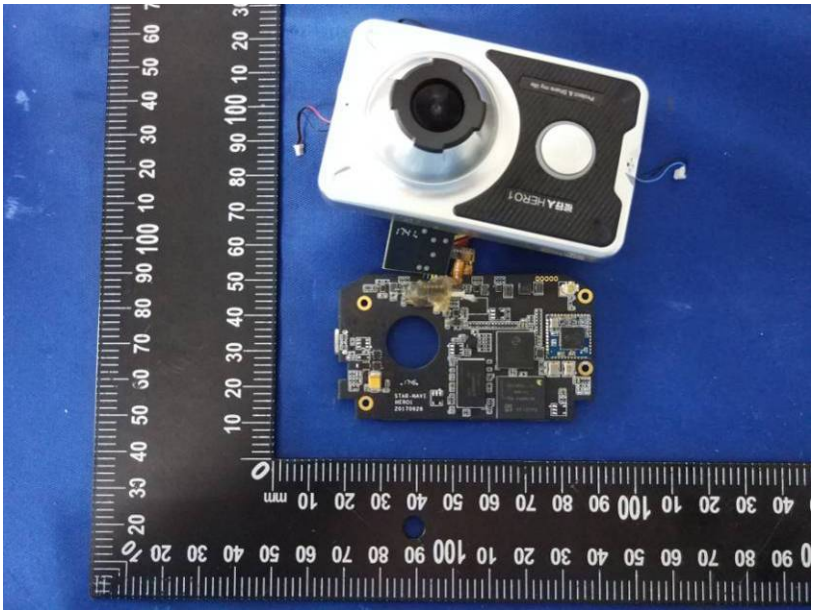
14 EUT Photos

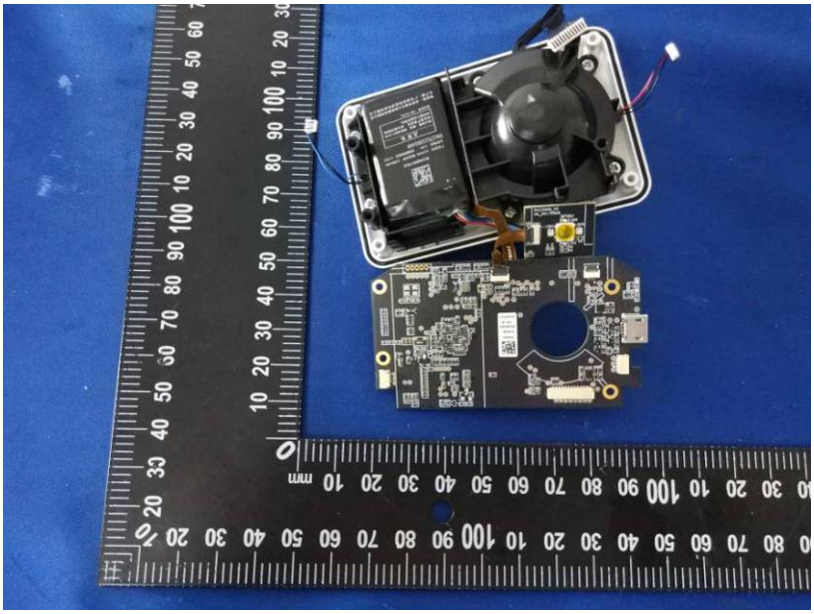


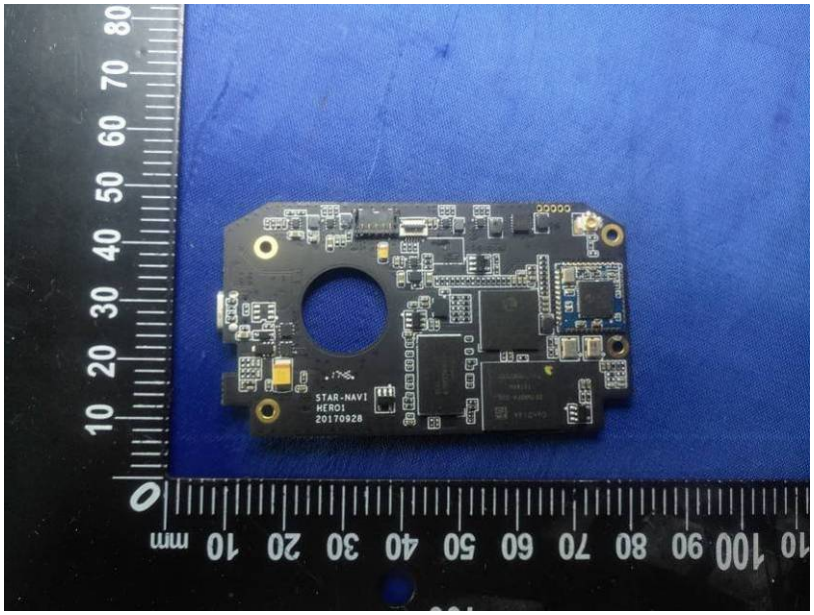


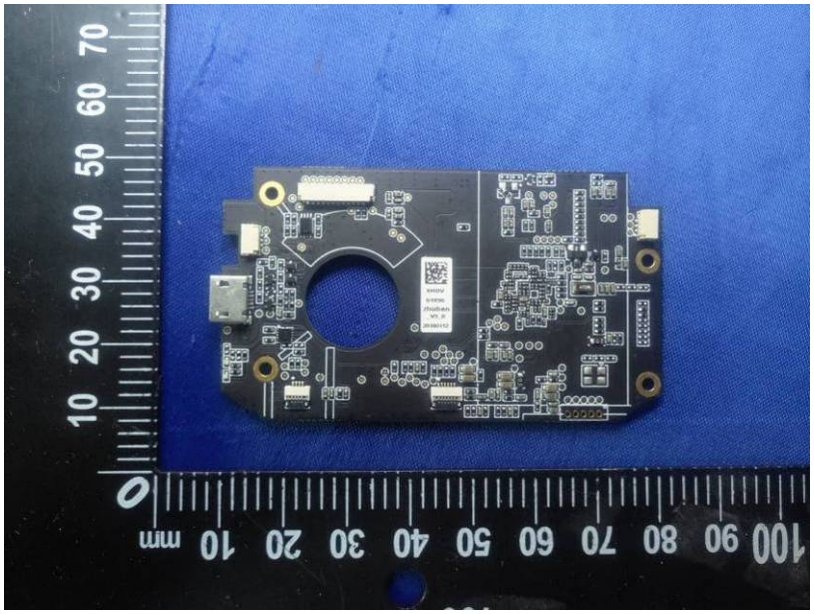


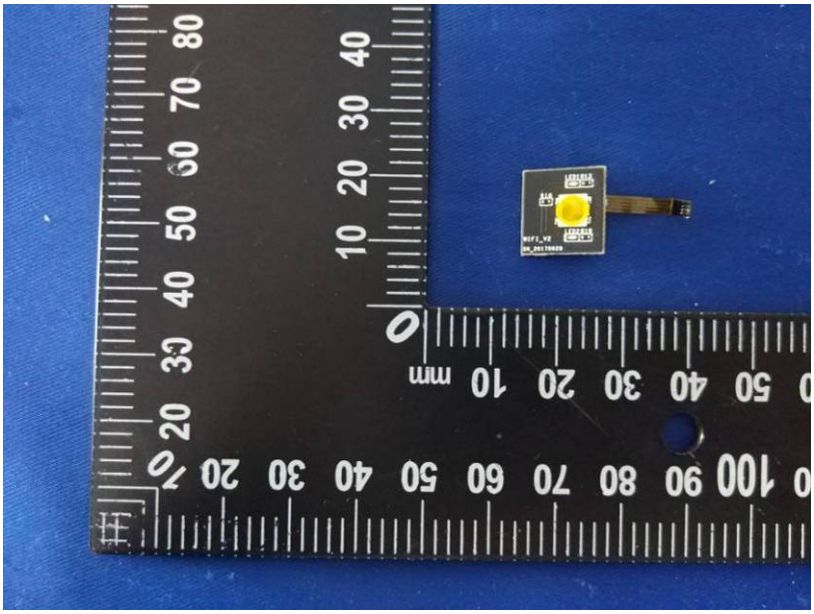


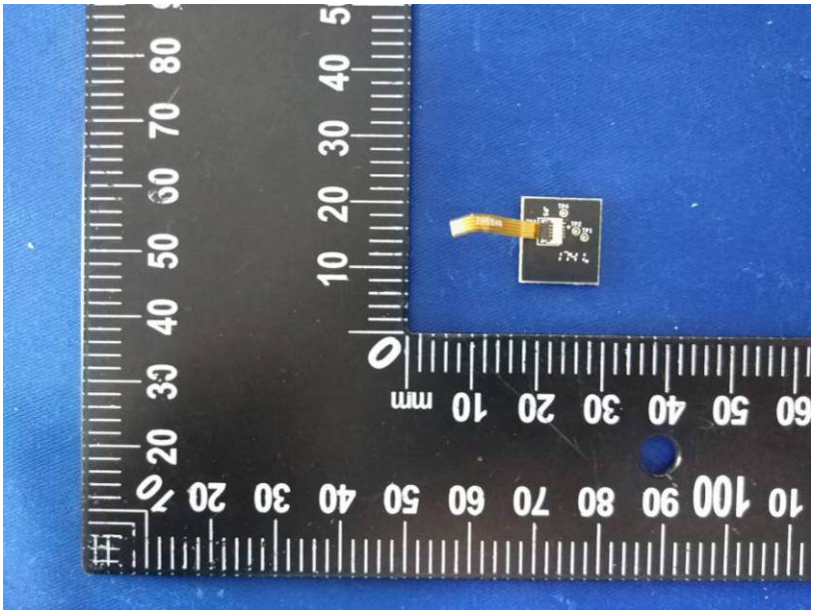


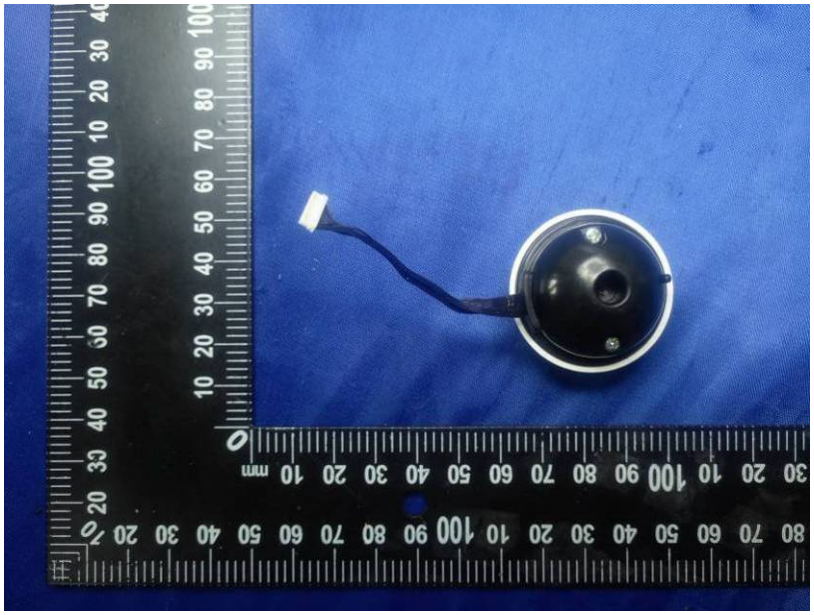


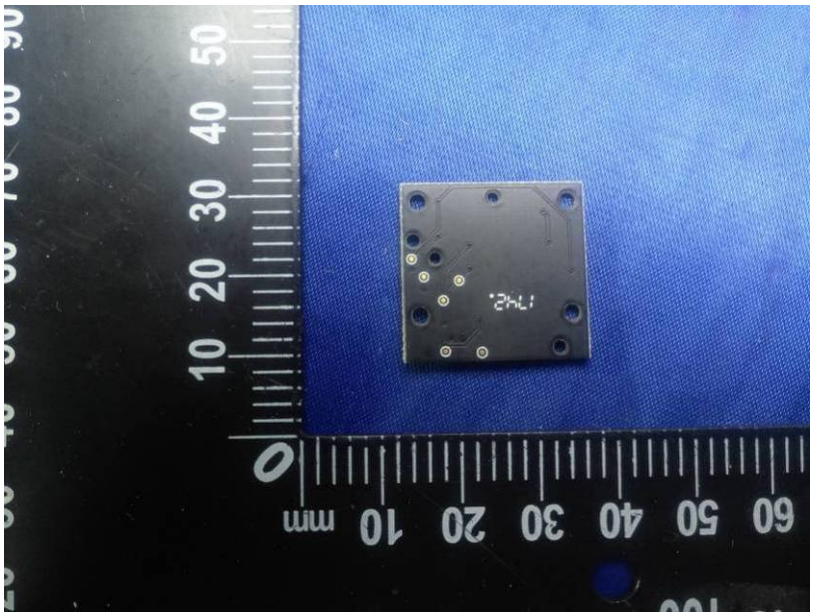

STAR-NAVI
HERO1
20170928

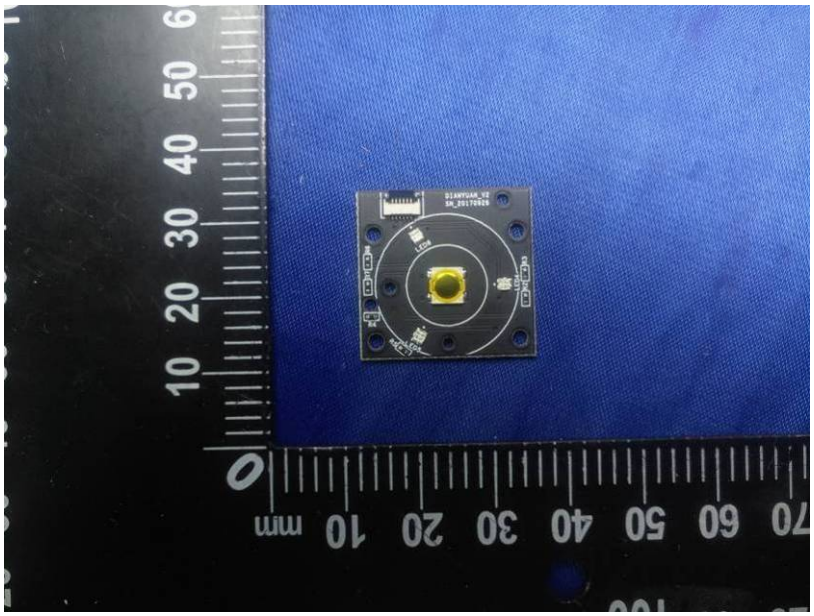


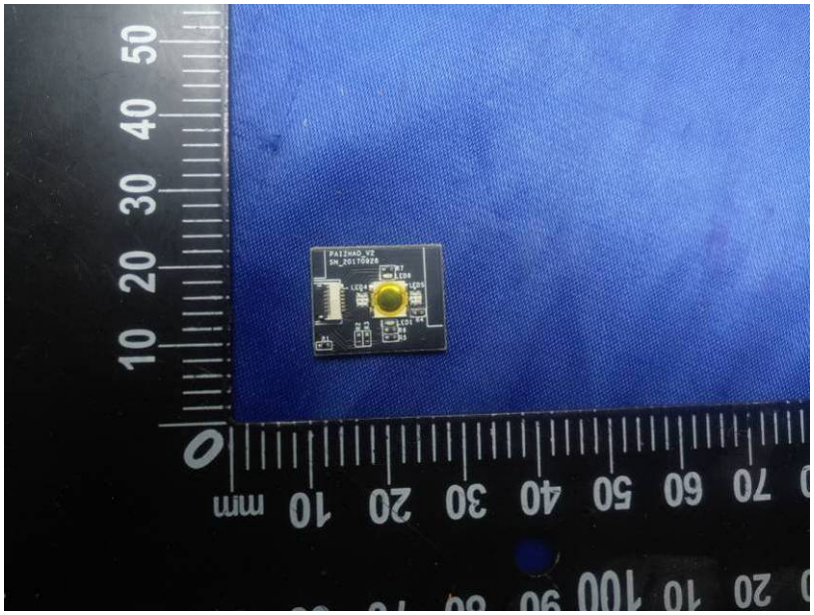


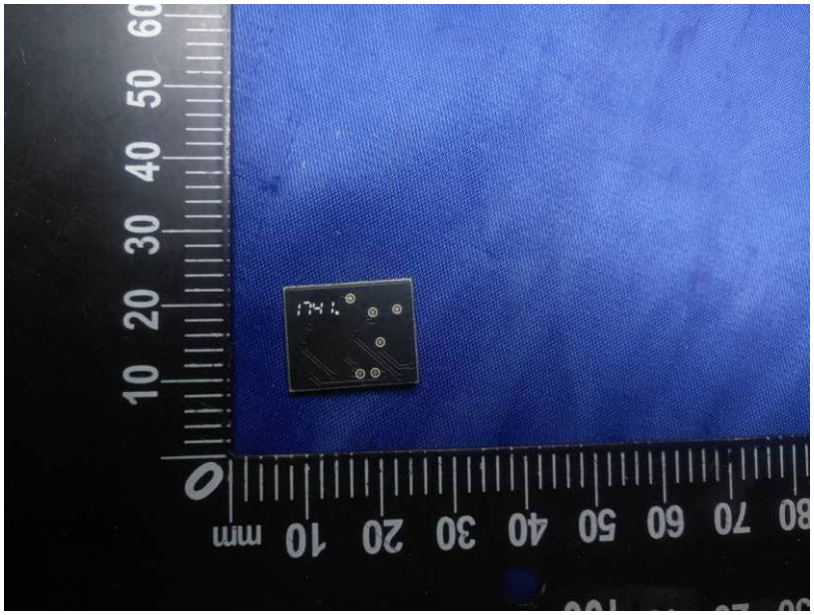


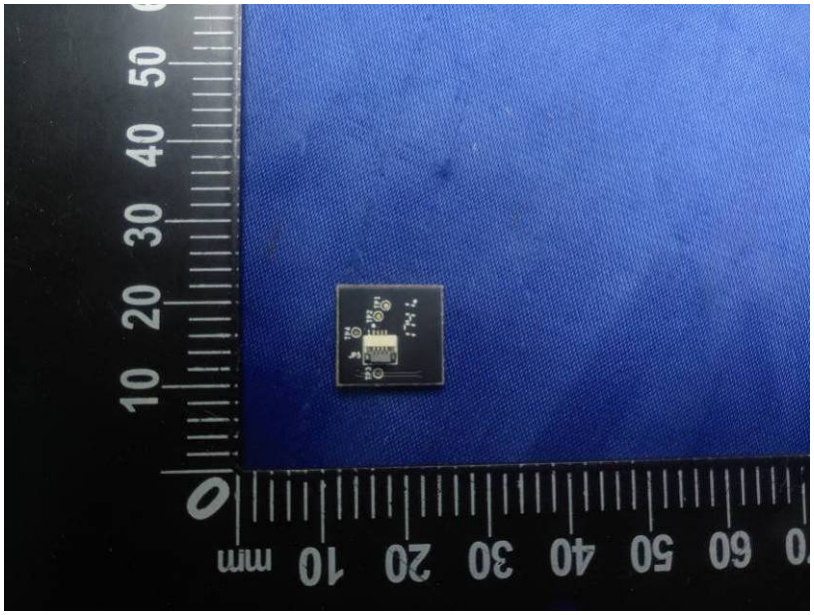


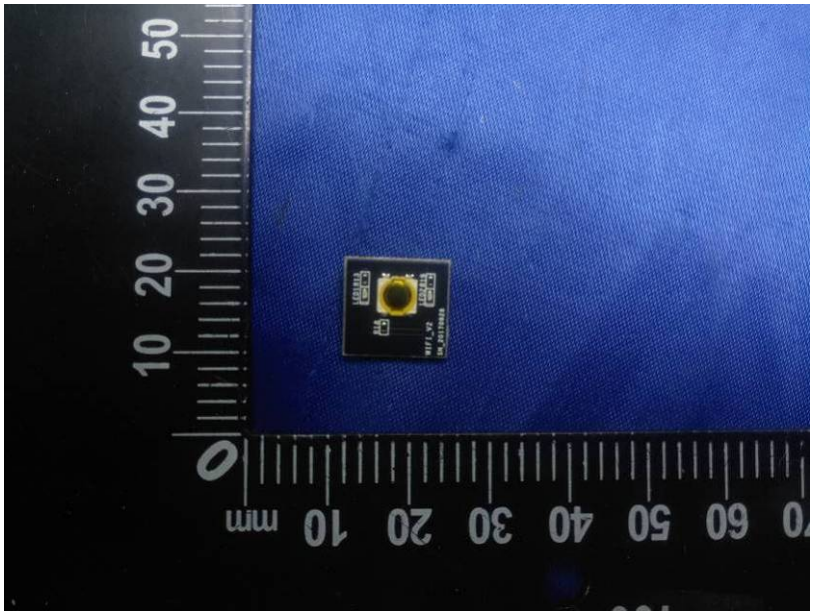


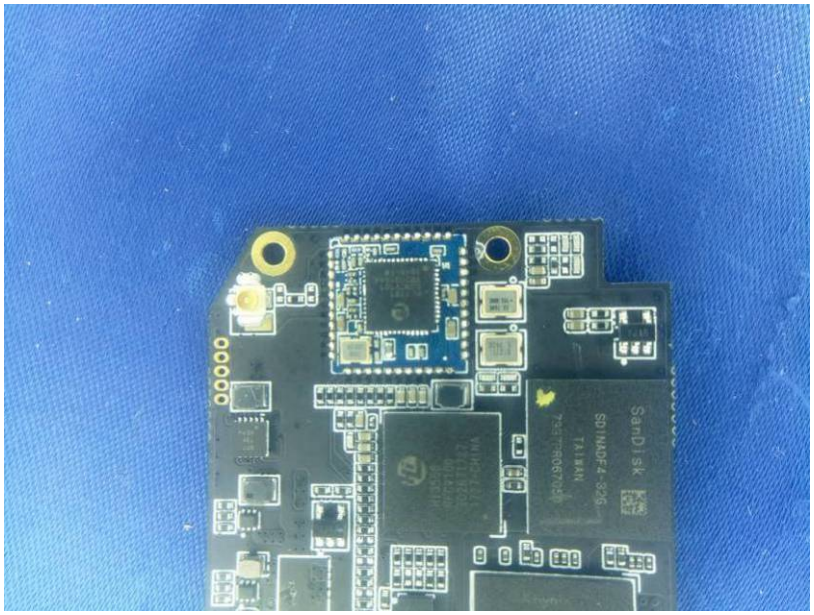


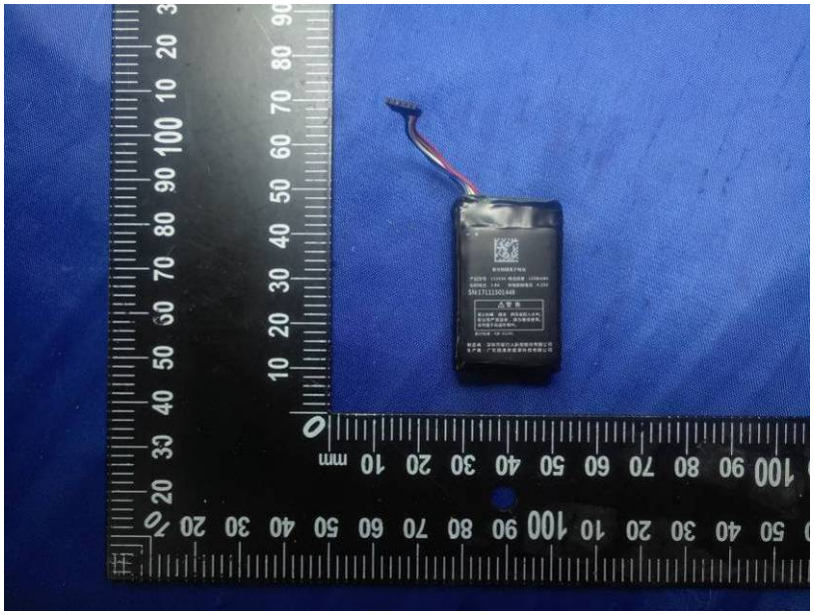


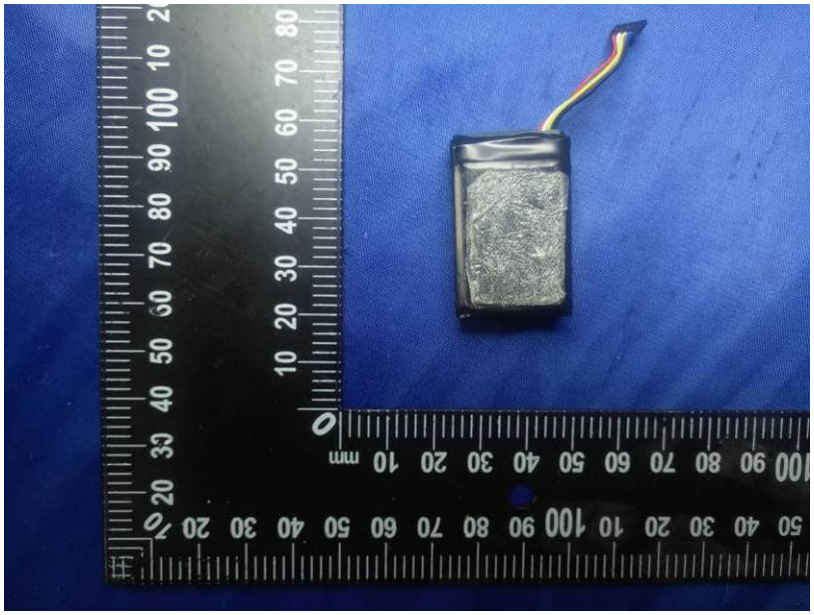







SanDisk





********THE END REPORT********