FCC TEST REPORT

FCC ID: 2AOKSBU3WU

Product	:	Wi-Fi Smart Power Strip
Model Name	:	BU3WU
Brand	:	BEISTON
Report No.	:	PTCDQ06171210501E-FC01

Prepared for

Huizhou Beisitong Electrical Appliances Co., Ltd

The right side of first floor, Building A , No53 Huitai Industrial Zone, Huizhou City, Guangdong Province, 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	:	Huizhou Beisitong Electrical Appliances Co., Ltd
Address	:	The right side of first floor, Building A , No53 Huitai Industrial Zone, Huizhou City, Guangdong Province, China
Manufacture's name	:	Huizhou Beisitong Electrical Appliances Co., Ltd
Address	:	The right side of first floor, Building A , No53 Huitai Industrial Zone, Huizhou City, Guangdong Province, China
Product name	:	Wi-Fi Smart Power Strip
Model name	:	BU3WU
Standards	:	FCC CFR47 Part 15 Section 15.247: 2017
Test procedure	:	ANSI C63.10:2013
Test Date	:	December 06, 2017 to December 28, 2017
Date of Issue	:	December 29, 2017
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	:	Wi-Fi Smart Power Strip
Model Name	:	BU3WU
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	:	PIFA Antenna
Antenna Gain	:	3 dBi
Power supply	:	AC 85-240V, 60Hz
Hardware Version	:	LY2321 REV:A0
Software Version	:	LY2321-2

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

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.	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	Apr. 7,2018
MIMO4TX-1	/	MIMO4TX	TW5451101	Apr. 7,2018
MXG Vector Signal Generator	Agilent	N5182A	MY50143410	Apr. 7,2018
MXG Analog Signal Generator	KEYSIGHT	N5181B	MY53050432	Apr. 7,2018

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 Emission (Test Frequency from 30MHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Sep. 03, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	Aug. 31, 2018
LOW NOISE AMPLIFIER	ZHINAN	ZN3380C	15002	Sep 03, 2018

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

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
Spectrum Analyzer	Agilent	E4407B	MY45109572	2018.08.25
Test Receiver	R&S	ESPI	101396	2018.08.27
Horn Antenna	SCHWARZBECK	9120D	9120D-1275	2018.08.27
Horn Ant	SCHWARZBECK	BBHA 9170	9170-181	2018.08.27
LOW NOISE AMPLIFIER	SCHWARZBECK	BBV9718	9718-270	2018.08.27
LOW NOISE AMPLIFIER	SCHWARZBECK	BBV9743	9743-119	2018.08.27

Conducted Emission

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	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.
Cement resistor	50W2.5Ω	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

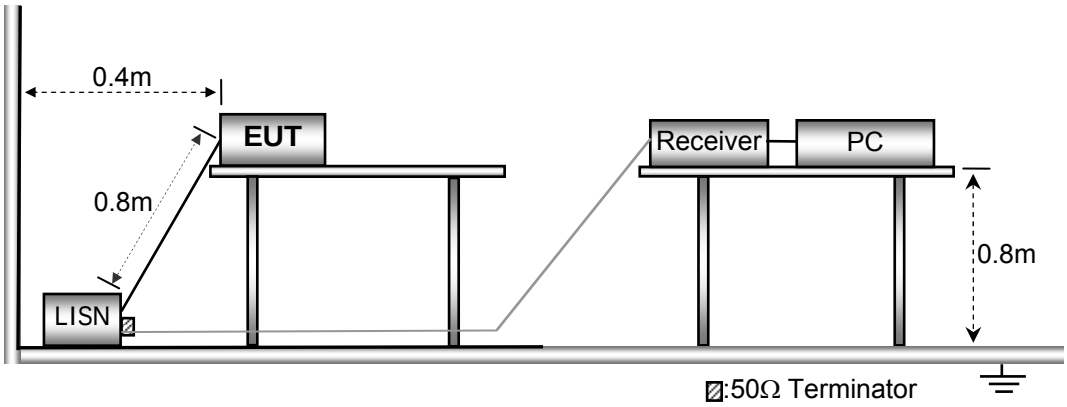
5.1 E.U.T. Operation

Operating Environment **:**

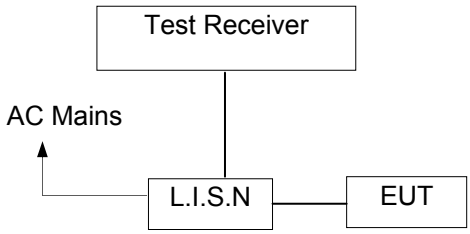
Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa

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

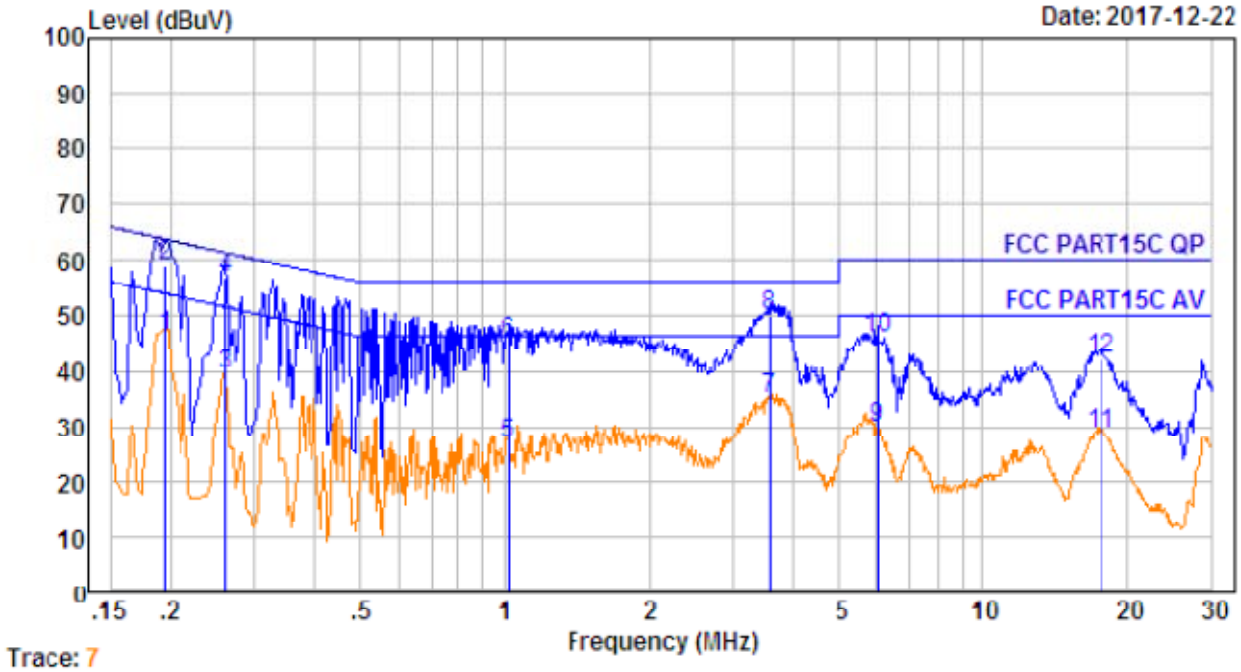
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

Pass.

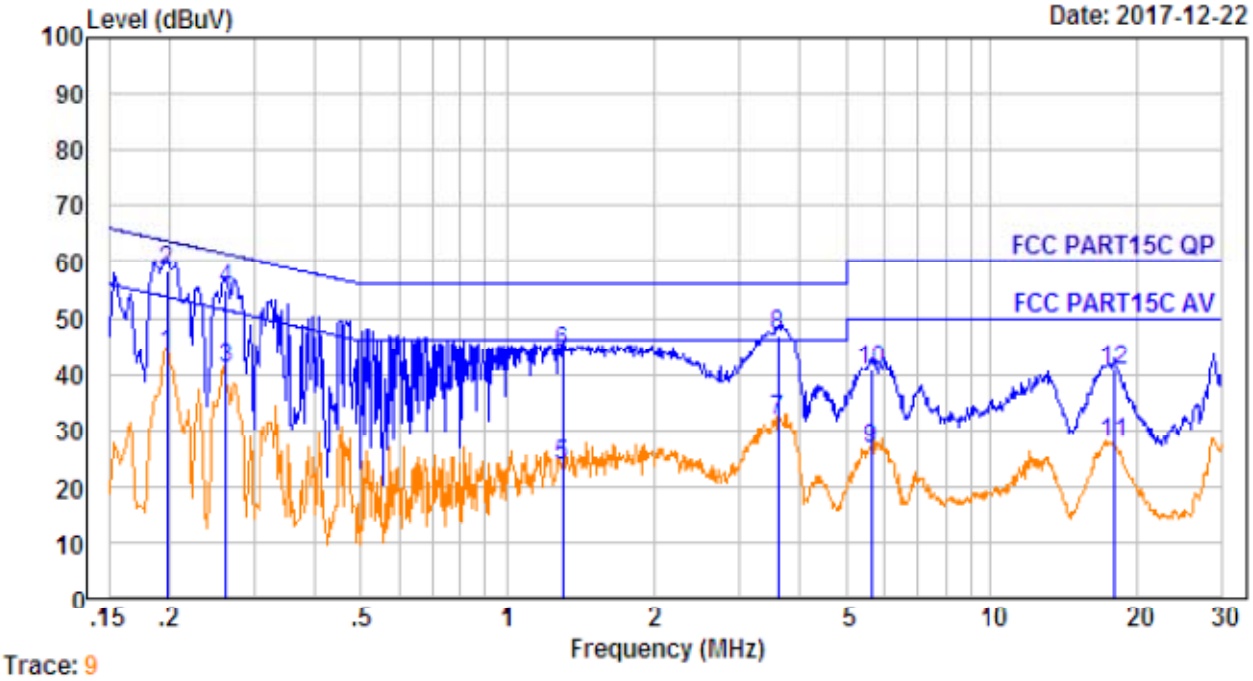
Please refer to the following pages.

Line-AC 120V/60Hz



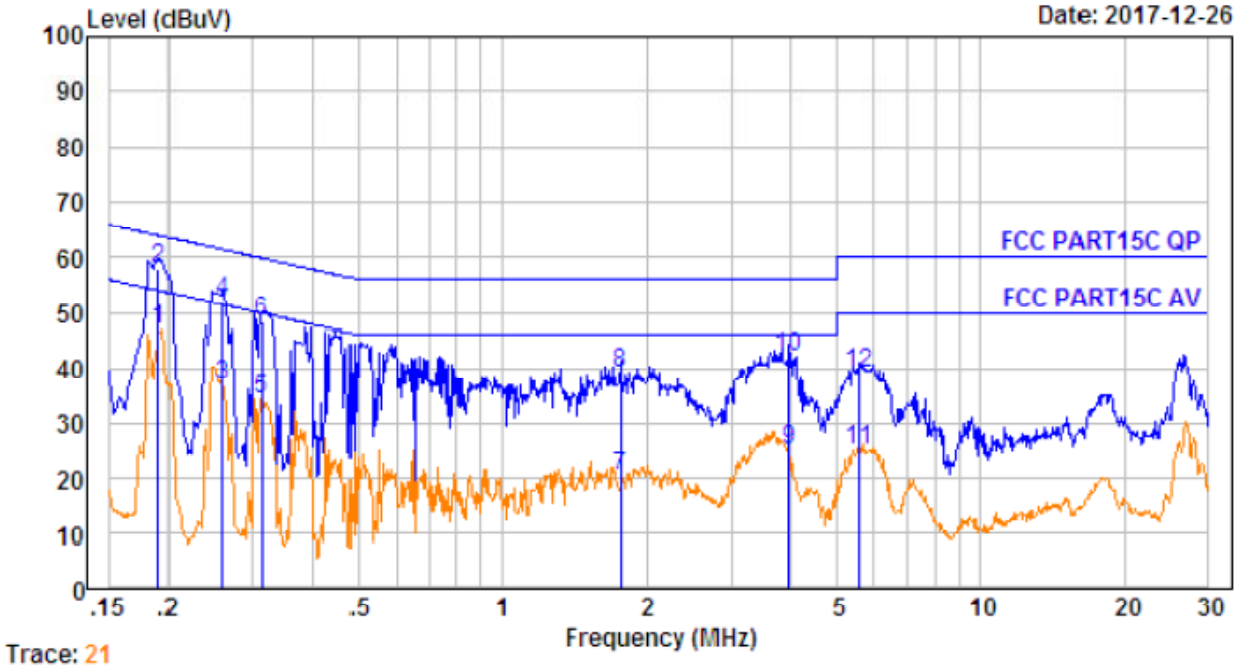
No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.194	0.27	9.58	36.40	46.25	53.84	-7.59	Average
2.	0.194	0.27	9.58	49.30	59.15	63.84	-4.69	QP
3.	0.262	0.34	9.65	29.00	38.99	51.38	-12.39	Average
4.	0.262	0.34	9.65	47.00	56.99	61.38	-4.39	QP
5.	1.016	0.46	9.82	16.83	27.11	46.00	-18.89	Average
6.	1.016	0.46	9.82	34.83	45.11	56.00	-10.89	QP
7.	3.584	0.47	9.89	24.51	34.87	46.00	-11.13	Average
8.	3.584	0.47	9.89	39.51	49.87	56.00	-6.13	QP
9.	6.024	0.53	9.96	19.42	29.91	50.00	-20.09	Average
10.	6.024	0.53	9.96	35.42	45.91	60.00	-14.09	QP
11.	17.661	0.46	9.91	18.59	28.96	50.00	-21.04	Average
12.	17.661	0.46	9.91	31.59	41.96	60.00	-18.04	QP

Neutral-AC 120V/60Hz



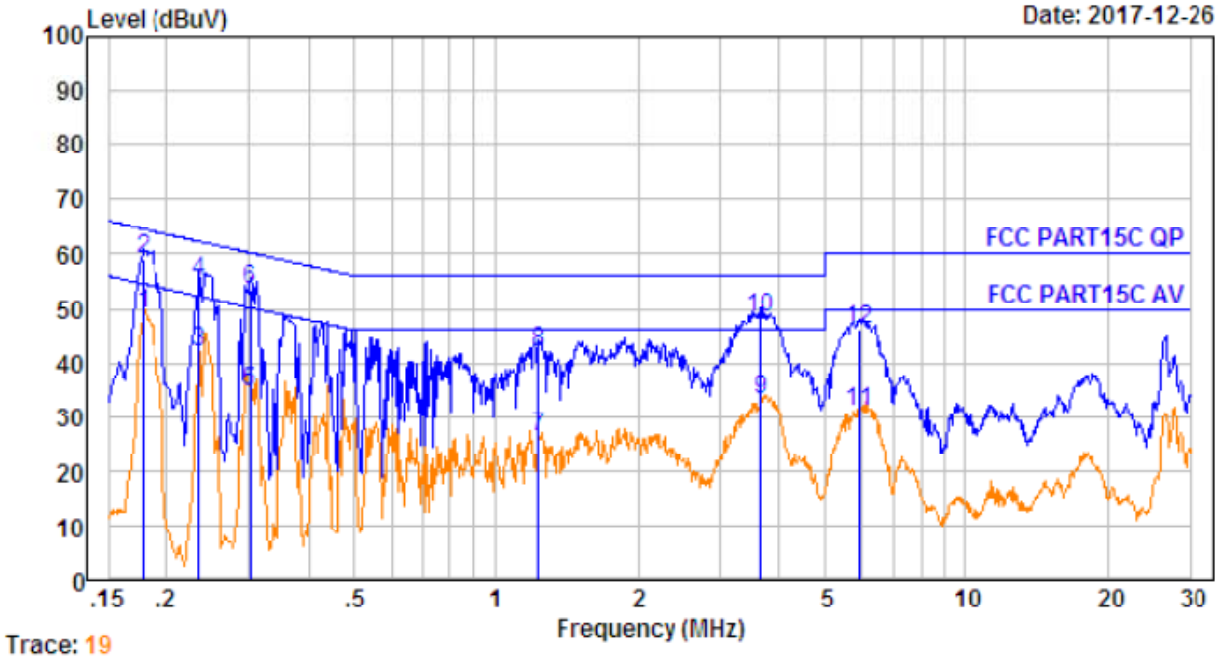
No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.198	0.28	9.62	33.47	43.37	53.71	-10.34	Average
2.	0.198	0.28	9.62	48.47	58.37	63.71	-5.34	QP
3.	0.262	0.34	9.68	30.86	40.88	51.38	-10.50	Average
4.	0.262	0.34	9.68	44.86	54.88	61.38	-6.50	QP
5.	1.303	0.46	9.86	13.46	23.78	46.00	-22.22	Average
6.	1.303	0.46	9.86	33.46	43.78	56.00	-12.22	QP
7.	3.623	0.47	9.93	21.28	31.68	46.00	-14.32	Average
8.	3.623	0.47	9.93	36.28	46.68	56.00	-9.32	QP
9.	5.623	0.52	9.97	16.24	26.73	50.00	-23.27	Average
10.	5.623	0.52	9.97	30.24	40.73	60.00	-19.27	QP
11.	17.944	0.45	10.01	17.28	27.74	50.00	-22.26	Average
12.	17.944	0.45	10.01	30.28	40.74	60.00	-19.26	QP

Line-AC 240V/60Hz



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.190	0.27	9.57	37.10	46.94	54.02	-7.08	Average
2.	0.190	0.27	9.57	48.10	57.94	64.02	-6.08	QP
3.	0.259	0.34	9.64	27.01	36.99	51.47	-14.48	Average
4.	0.259	0.34	9.64	42.01	51.99	61.47	-9.48	QP
5.	0.313	0.38	9.68	24.20	34.26	49.88	-15.62	Average
6.	0.313	0.38	9.68	38.20	48.26	59.88	-11.62	QP
7.	1.762	0.47	9.84	9.89	20.20	46.00	-25.80	Average
8.	1.762	0.47	9.84	28.89	39.20	56.00	-16.80	QP
9.	3.964	0.47	9.90	14.73	25.10	46.00	-20.90	Average
10.	3.964	0.47	9.90	31.73	42.10	56.00	-13.90	QP
11.	5.594	0.52	9.94	14.64	25.10	50.00	-24.90	Average
12.	5.594	0.52	9.94	28.64	39.10	60.00	-20.90	QP

Neutral-AC 240V/60Hz



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.178	0.25	9.58	39.11	48.94	54.59	-5.65	Average
2.	0.178	0.25	9.58	49.11	58.94	64.59	-5.65	QP
3.	0.234	0.31	9.65	31.96	41.92	52.30	-10.38	Average
4.	0.234	0.31	9.65	44.96	54.92	62.30	-7.38	QP
5.	0.302	0.37	9.71	24.57	34.65	50.19	-15.54	Average
6.	0.302	0.37	9.71	43.57	53.65	60.19	-6.54	QP
7.	1.236	0.46	9.86	15.90	26.22	46.00	-19.78	Average
8.	1.236	0.46	9.86	31.90	42.22	56.00	-13.78	QP
9.	3.661	0.47	9.93	22.95	33.35	46.00	-12.65	Average
10.	3.661	0.47	9.93	37.95	48.35	56.00	-7.65	QP
11.	5.929	0.53	9.98	20.47	30.98	50.00	-19.02	Average
12.	5.929	0.53	9.98	35.47	45.98	60.00	-14.02	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

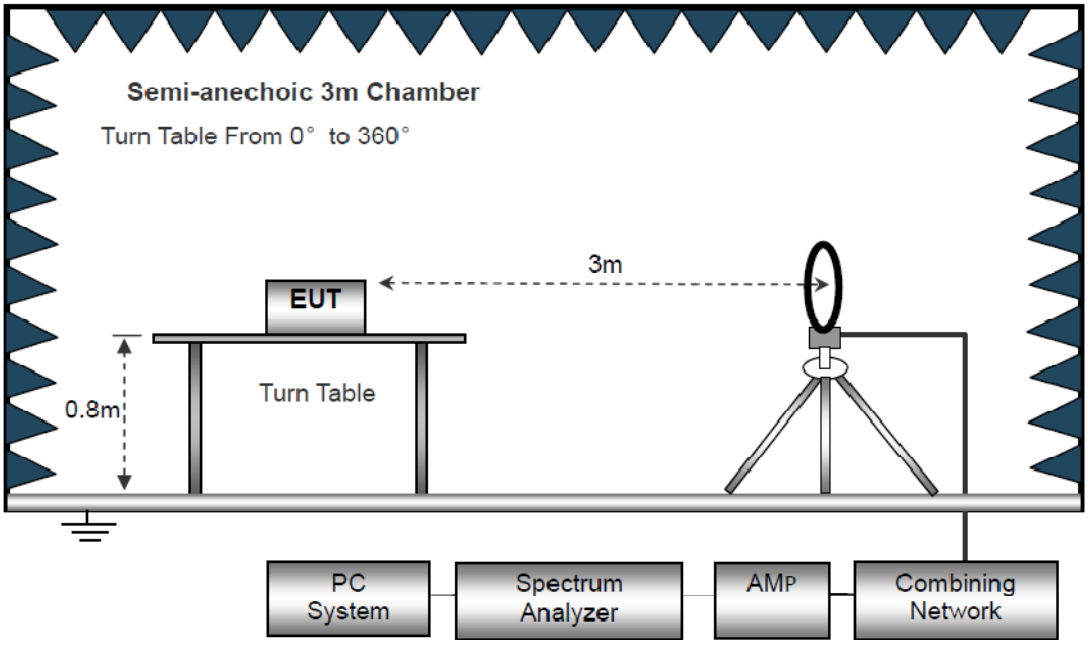
Humidity: : 51.1 % RH

Atmospheric Pressure: : 101.2kPa

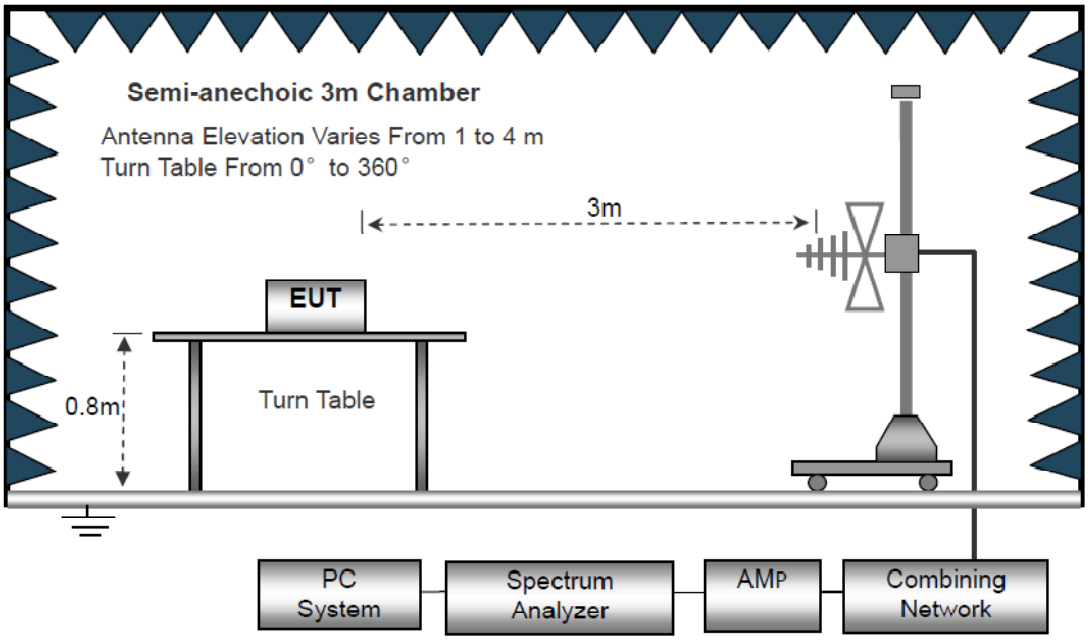
6.2 Test Setup

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

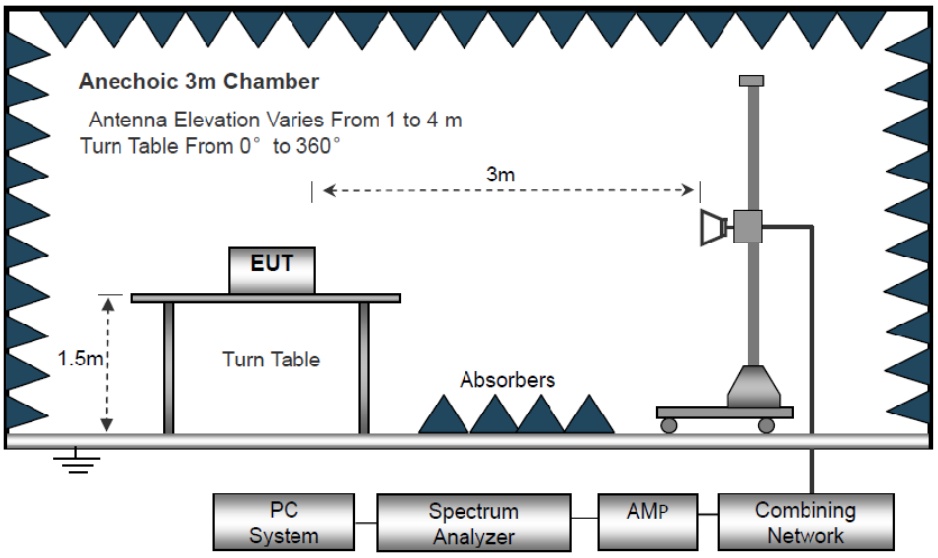
The test setup for emission measurement below 30MHz



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.

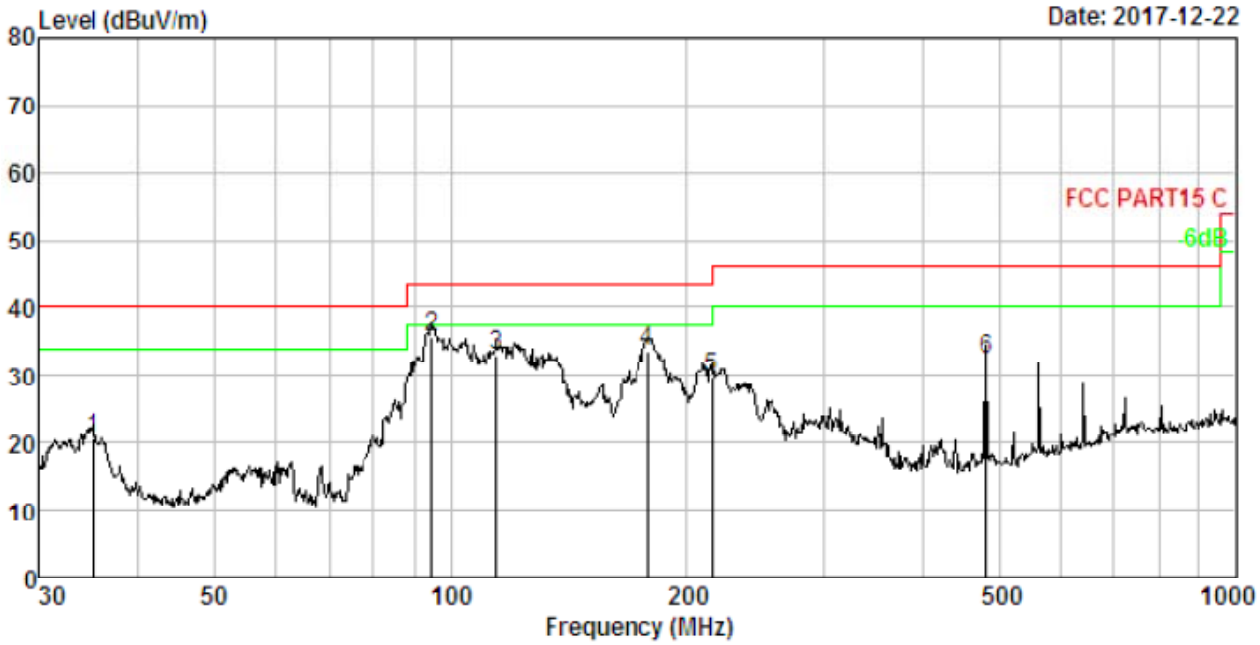
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Radiated emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (ANT 1: 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:

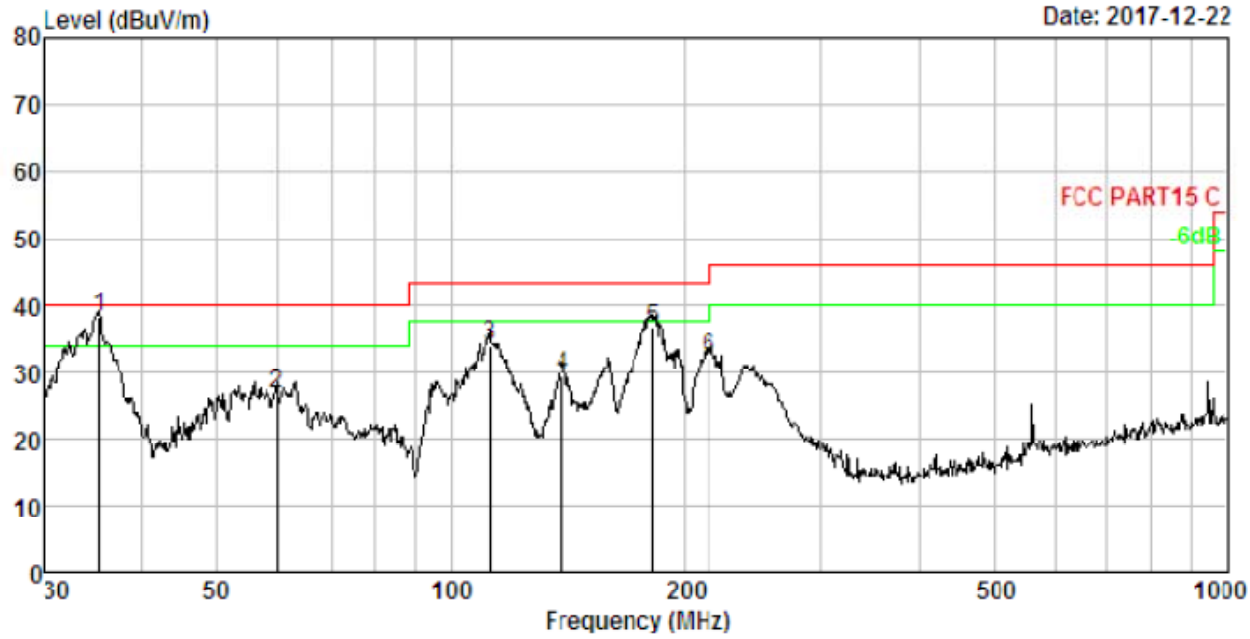
Antenna Polarization: Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	35.128	1.20	13.41	36.08	30.02	20.67	40.00	-19.33	QP
2.	94.760	2.10	9.72	54.20	30.37	35.65	43.50	-7.85	QP
3.	114.114	2.26	11.48	49.80	30.43	33.11	43.50	-10.39	QP
4.	178.758	2.67	12.55	49.02	30.59	33.65	43.50	-9.85	QP
5.	215.268	2.84	10.67	46.90	30.66	29.75	43.50	-13.75	QP
6.	480.528	3.57	16.89	43.00	30.94	32.52	46.00	-13.48	QP

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

Antenna Polarization: Vertical



No.	Frec MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	35.251	1.20	13.41	53.66	30.03	38.24	40.00	-1.76	QP
2.	59.859	1.68	12.16	43.10	30.21	26.73	40.00	-13.27	QP
3.	112.524	2.25	11.32	50.91	30.43	34.05	43.50	-9.45	QP
4.	139.361	2.45	13.31	44.25	30.50	29.51	43.50	-13.99	QP
5.	182.559	2.69	12.09	52.48	30.60	36.66	43.50	-6.84	QP
6.	214.514	2.84	10.66	49.26	30.65	32.11	43.50	-11.39	QP

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

Test Frequency 1GHz-18GHz:

Low Channel (2412MHz) 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)
4824	29.56	AV	V	29.41	7.85	23.05	43.77	54	-10.23
4824	28.04	AV	H	29.41	7.85	23.05	42.25	54	-11.75
4824	30.18	PK	V	29.41	7.85	23.05	44.39	74	-29.61
4824	31.62	PK	H	29.41	7.85	23.05	45.83	74	-28.17
16587	30.28	AV	V	30.25	9.66	25.78	44.41	54	-9.59
16587	33.24	AV	H	30.25	9.66	25.78	47.37	54	-6.63
16587	28.04	PK	V	30.25	9.66	25.78	42.17	74	-31.83
16587	30.25	PK	H	30.25	9.66	25.78	44.38	74	-29.62

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	29.13	AV	V	28.04	9.05	19.74	46.48	54	-7.52
4874	28.57	AV	H	28.04	9.05	19.74	45.92	54	-8.08
4874	26.41	PK	V	28.04	9.05	19.74	43.76	74	-30.24
4874	30.25	PK	H	28.04	9.05	19.74	47.6	74	-26.4
16555	31.29	AV	V	23.69	11.22	25.04	41.16	54	-12.84
16555	33.05	AV	H	23.69	11.22	25.04	42.92	54	-11.08
16555	30.58	PK	V	23.69	11.22	25.04	40.45	74	-33.55
16555	33.16	PK	H	23.69	11.22	25.04	43.03	74	-30.97

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	29.55	AV	V	20.35	8.05	23.06	34.89	54	-19.11
4924	27.41	AV	H	20.35	8.05	23.06	32.75	54	-21.25
4924	28.01	PK	V	20.35	8.05	23.06	33.35	74	-40.65
4924	30.36	PK	H	20.35	8.05	23.06	35.7	74	-38.3
17255	29.45	AV	V	19.42	17.46	24.19	42.14	54	-11.86
17255	30.05	AV	H	19.42	17.46	24.19	42.74	54	-11.26
17255	31.24	PK	V	19.42	17.46	24.19	43.93	74	-30.07
17255	28.56	PK	H	19.42	17.46	24.19	41.25	74	-32.75

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)).

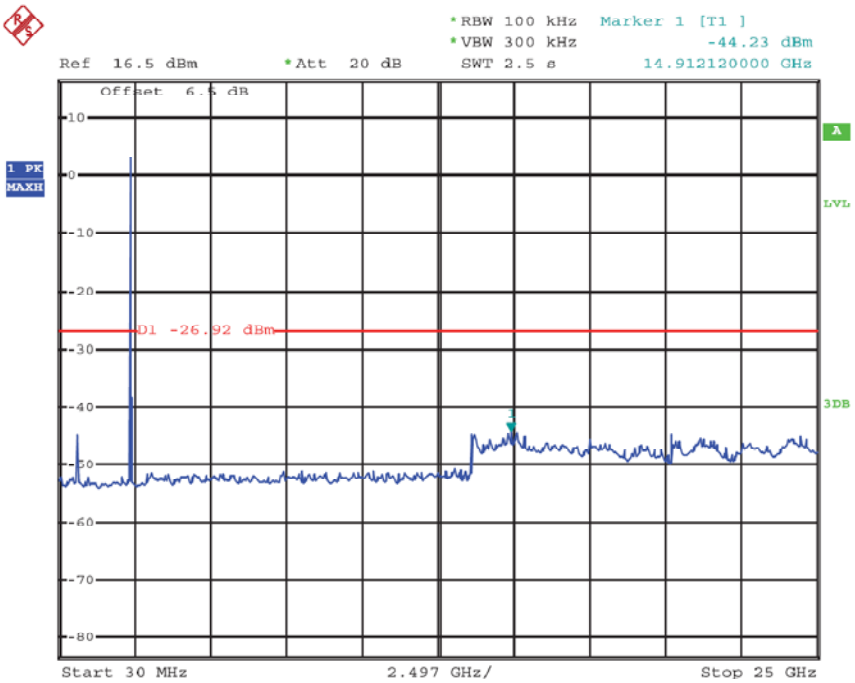
7.1 Test Procedure

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

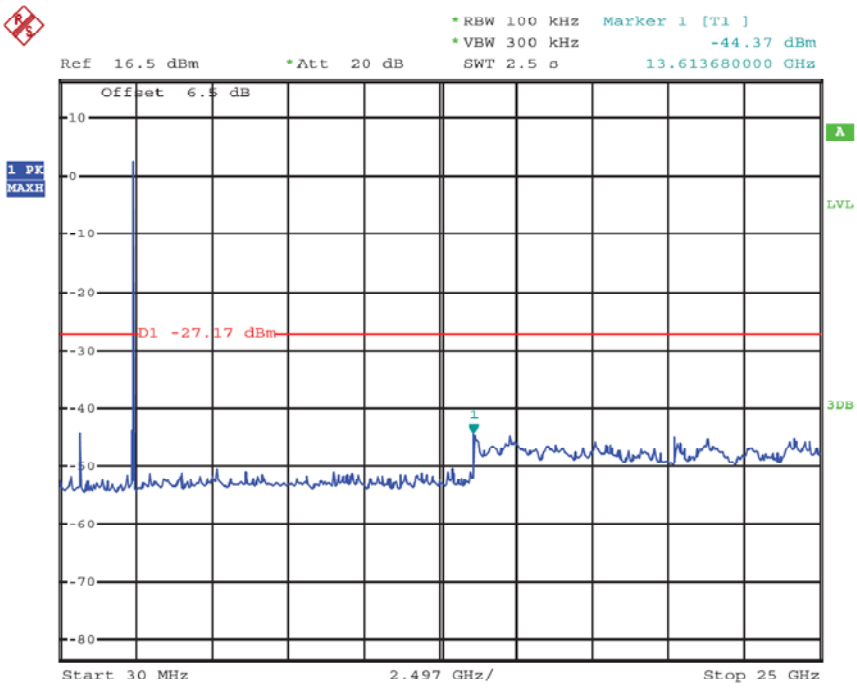
7.2 Test Result

802.11 b

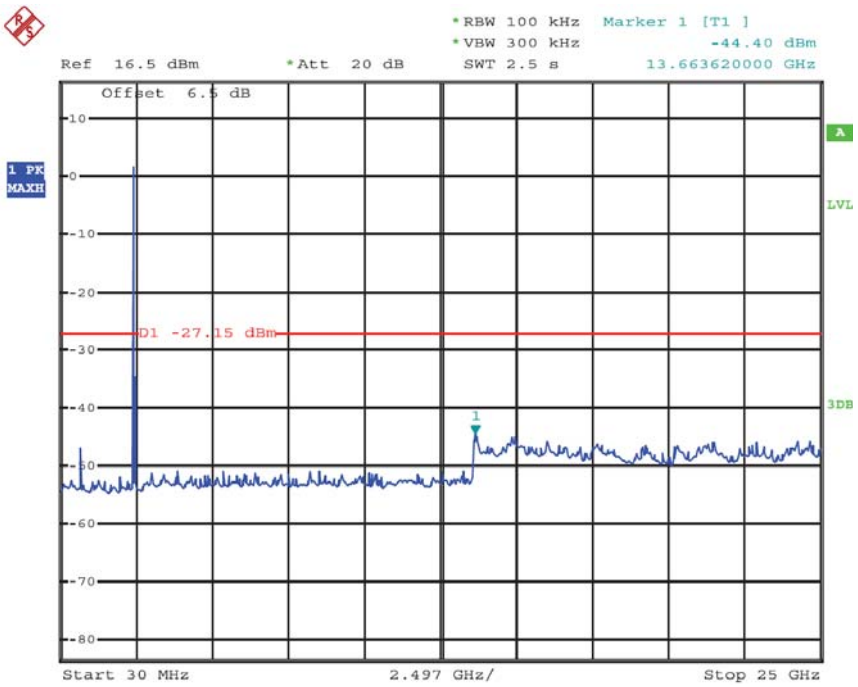
Low Channel



Middle Channel

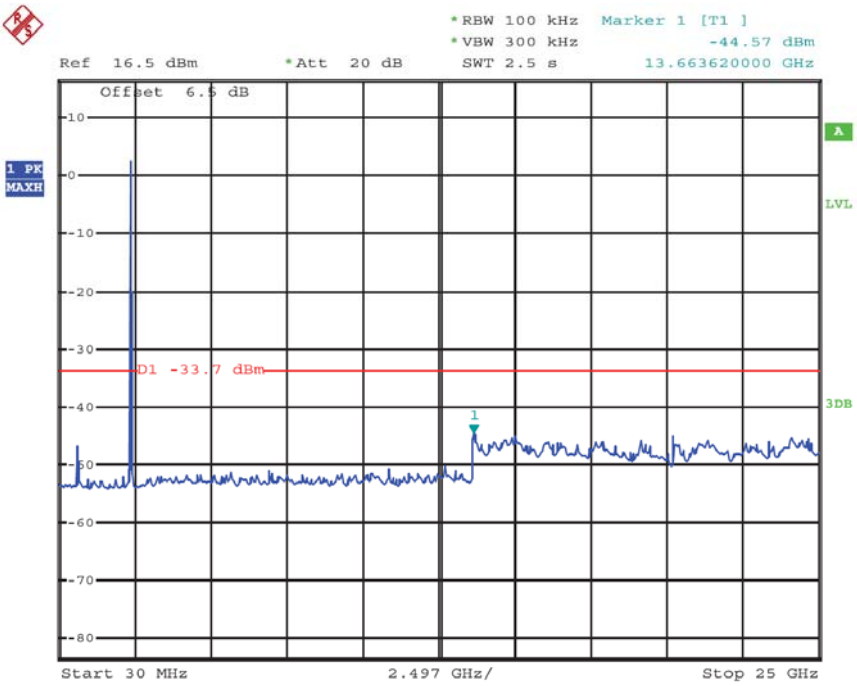


High Channel

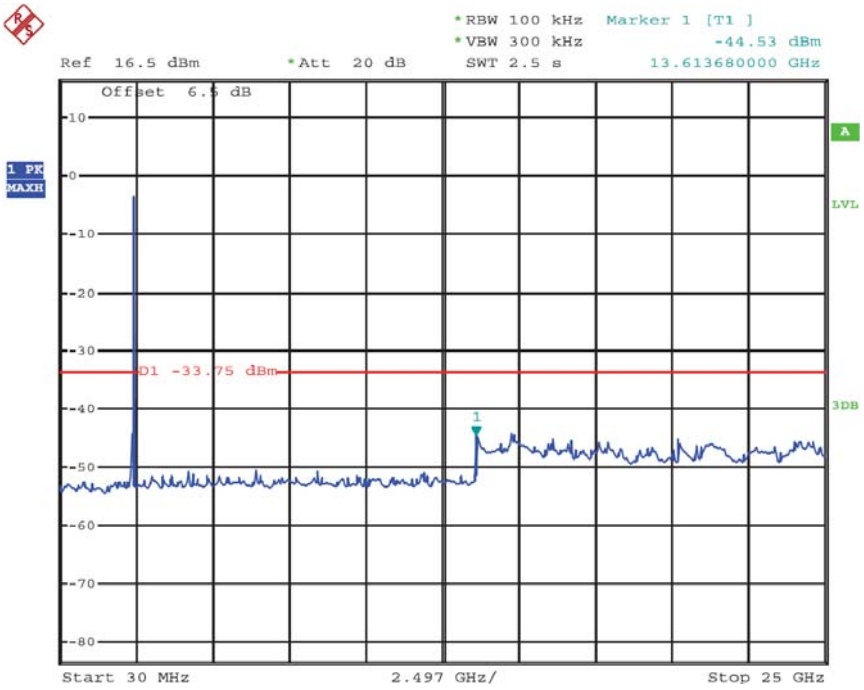


802.11g

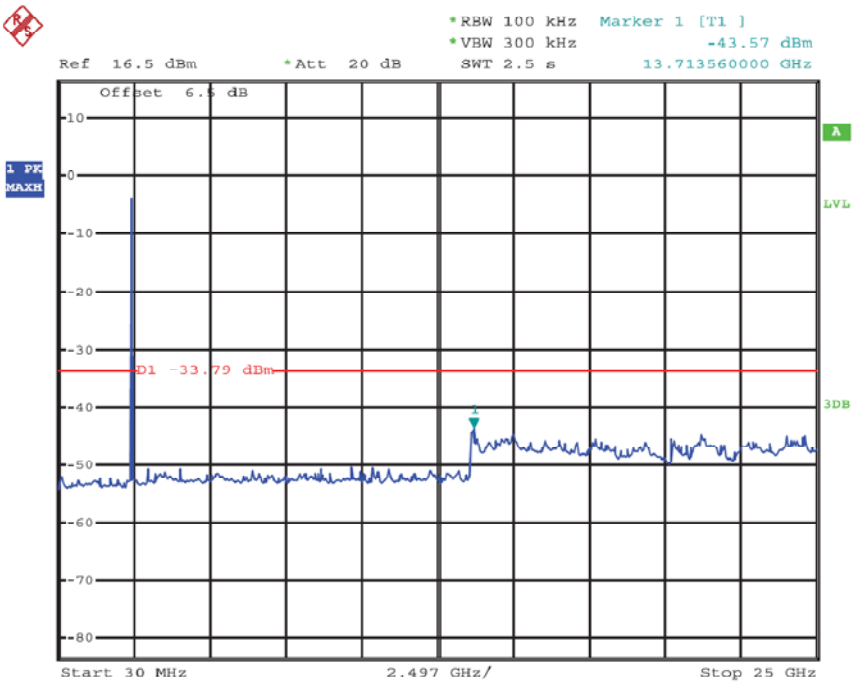
Low Channel



Middle Channel

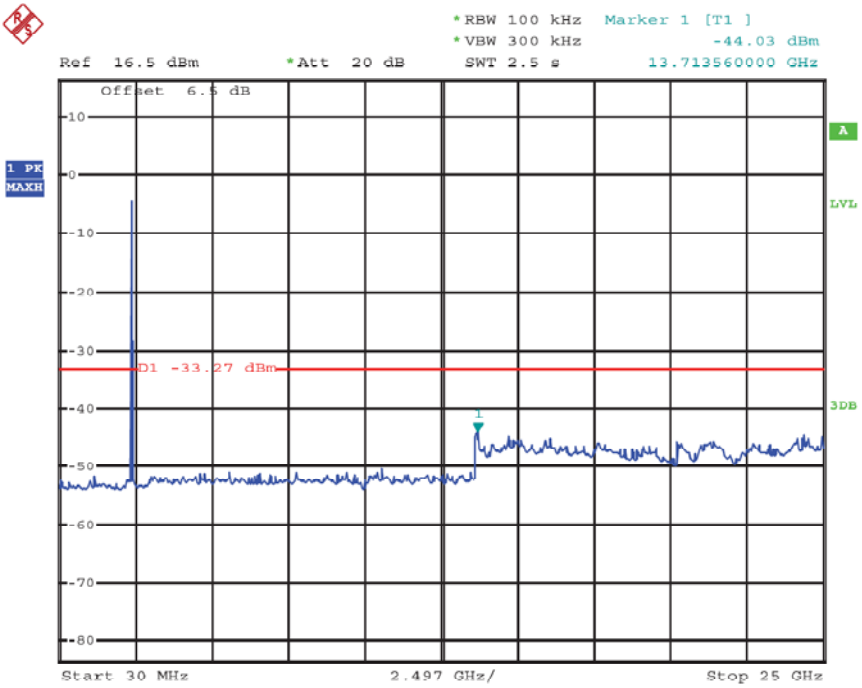


High Channel

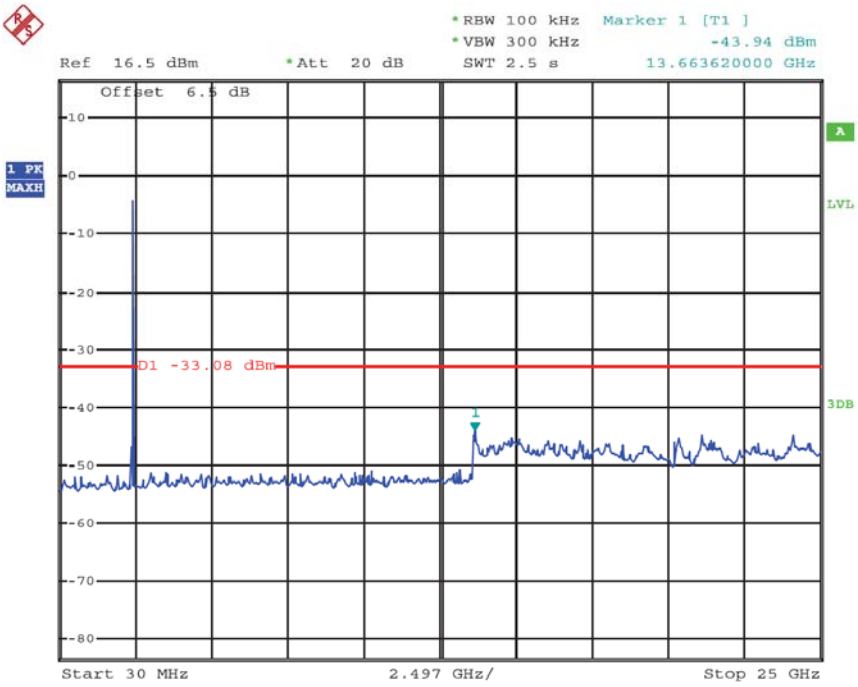


802.11n-HT20

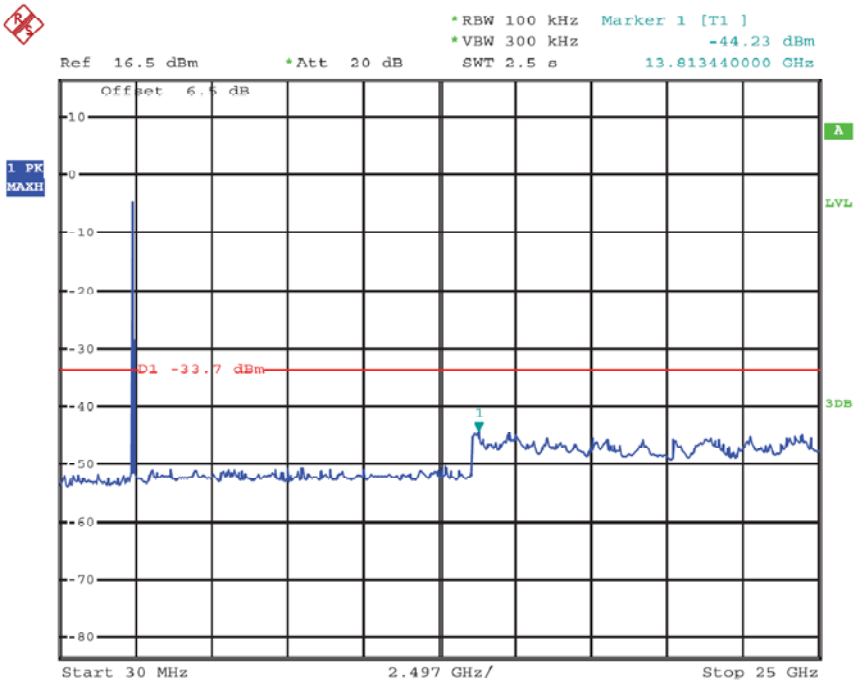
Low Channel



Middle Channel

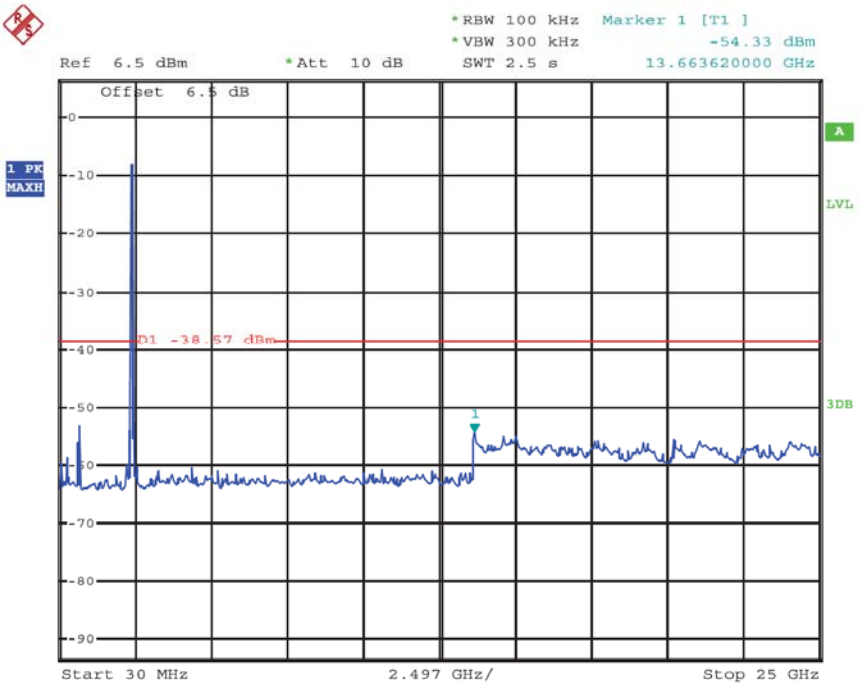


High Channel

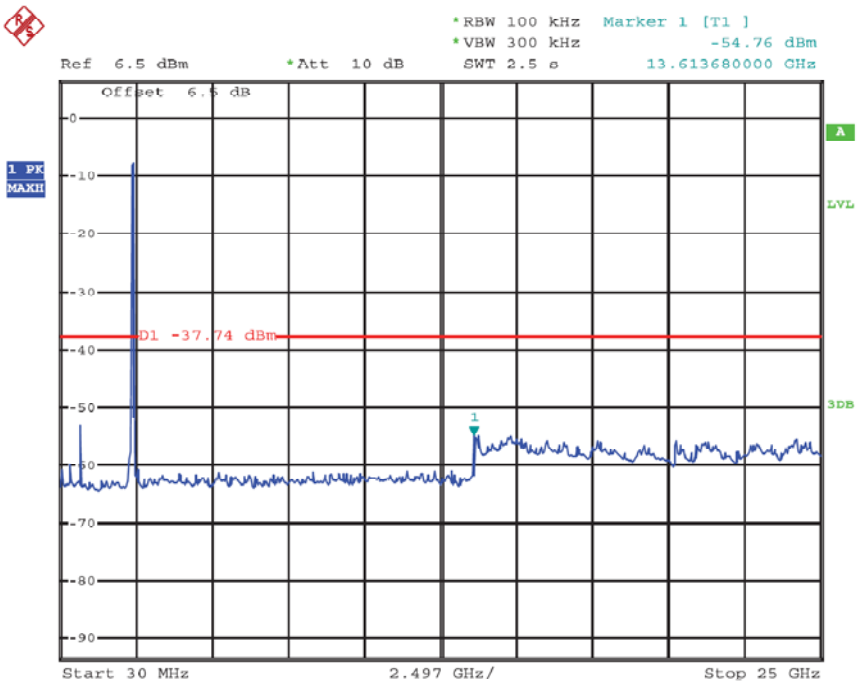


802.11n-HT40

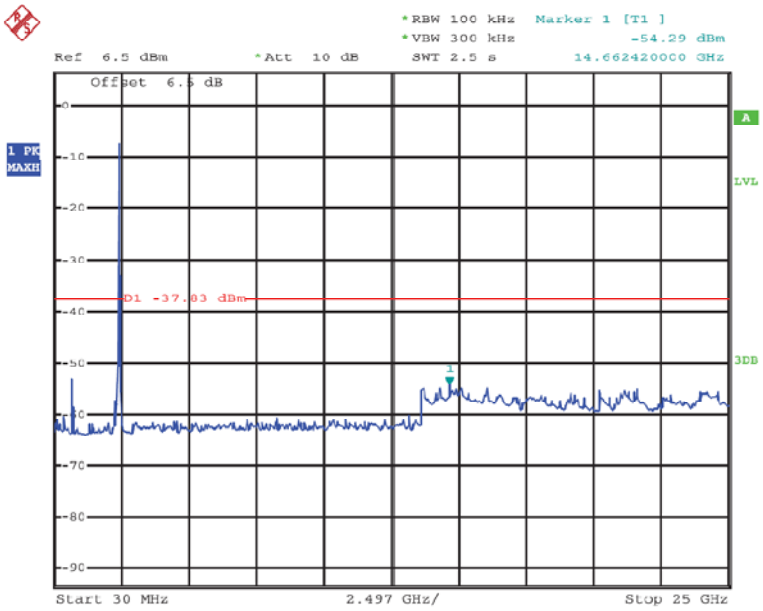
Low Channel



Middle Channel



High Channel



8 Band Edge Measurement

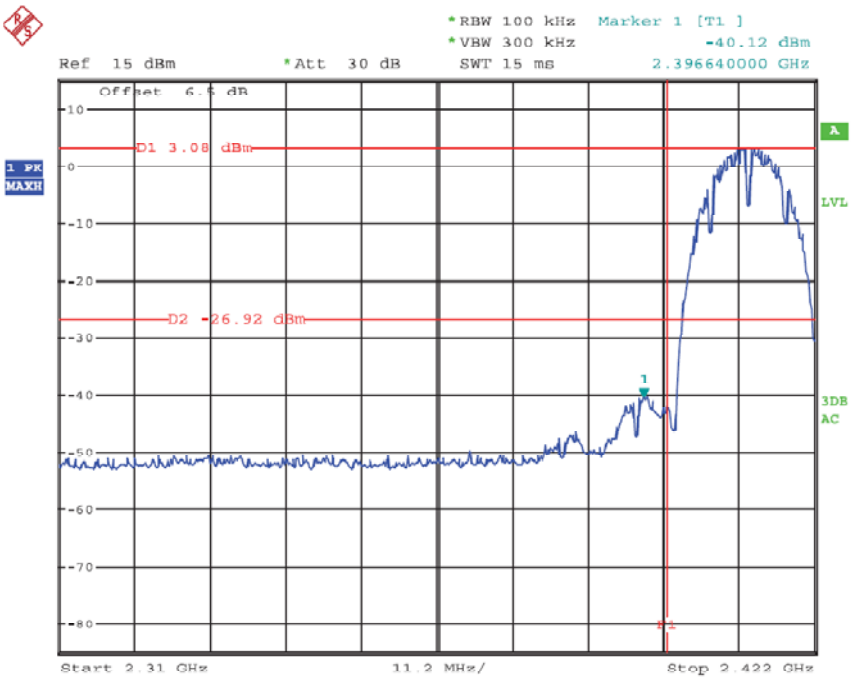
Test Requirement	:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (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)).

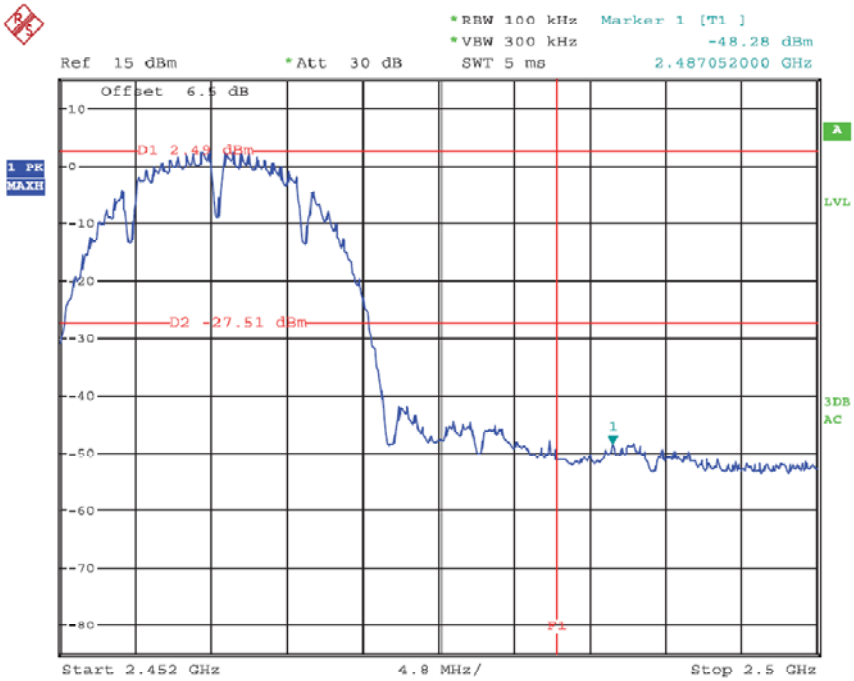
8.1 Test Procedure

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

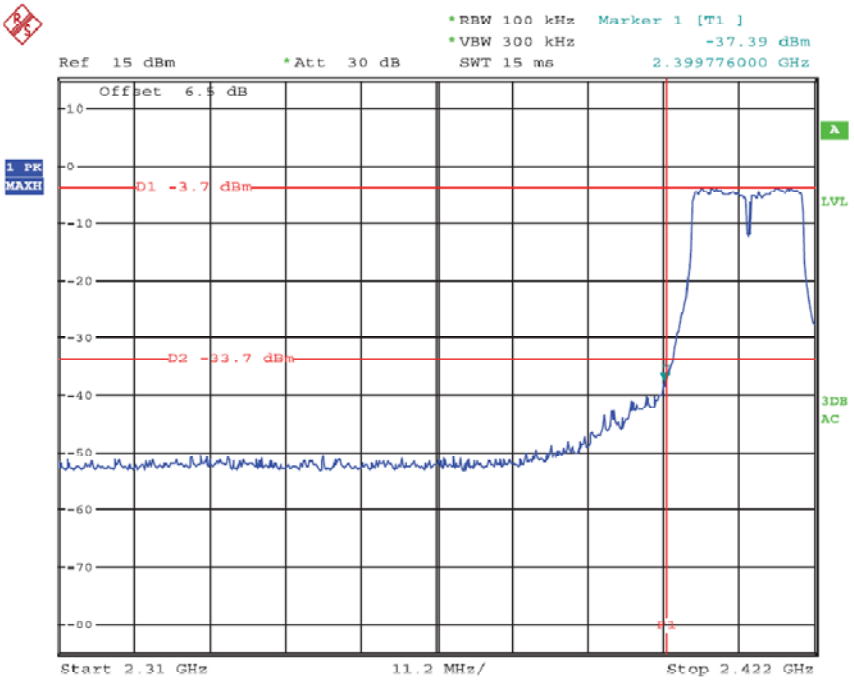
8.2 Test Result

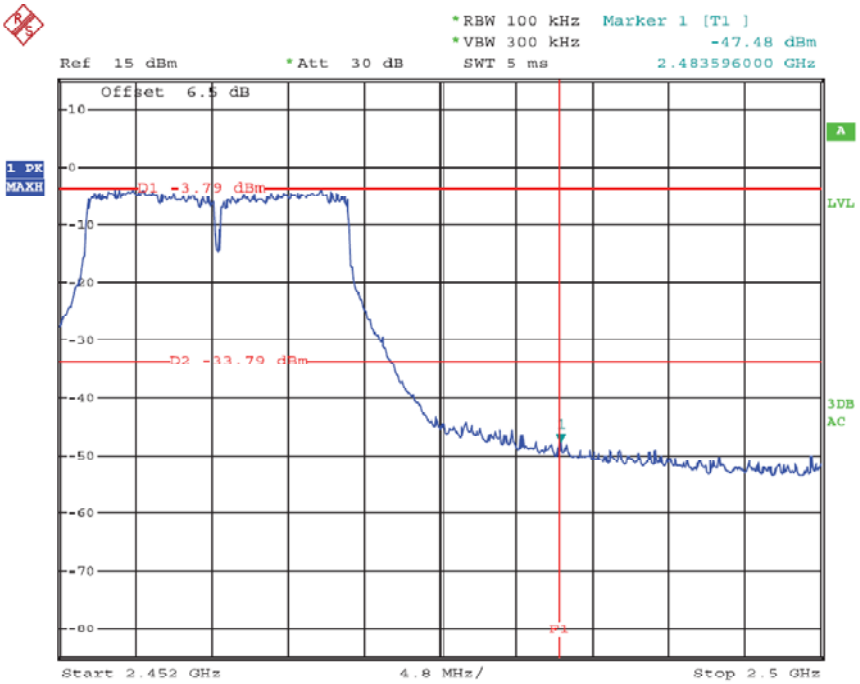
802.11b



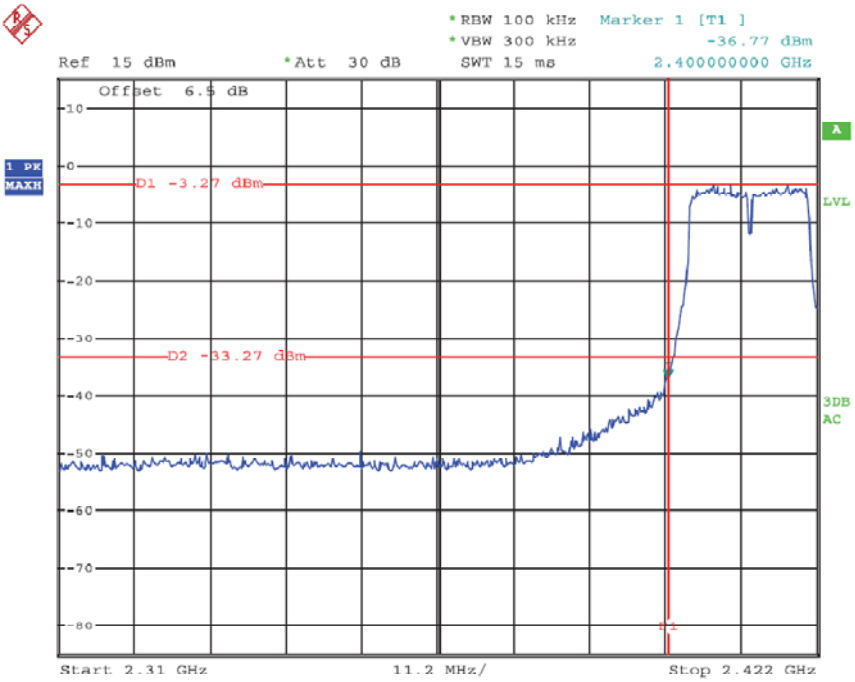


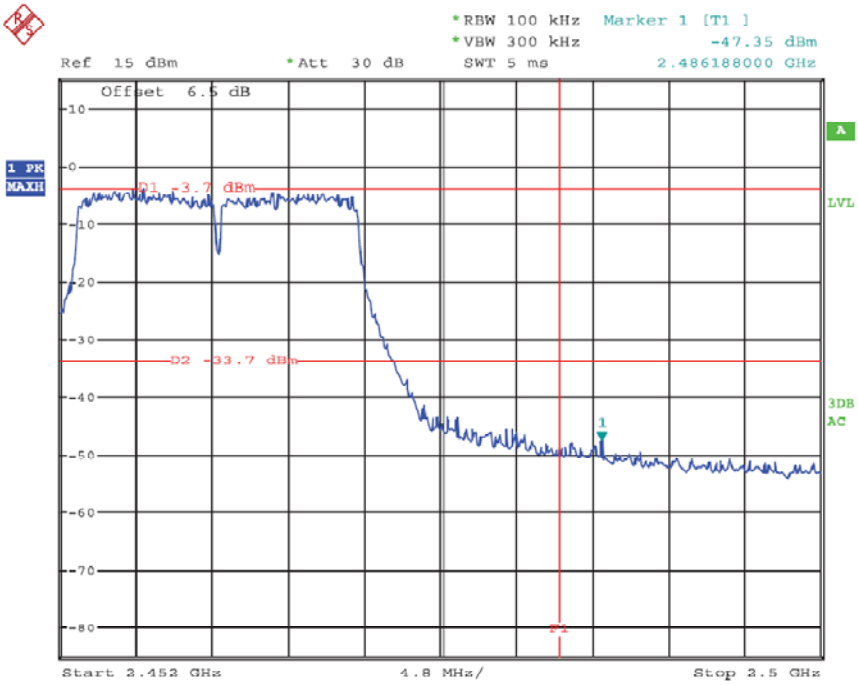
802.11g


RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
-37.39 dBm
2.399776000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
D1 -3.7 dBm
D2 -33.7 dBm
A
LVL
3DB
AC
Start 2.31 GHz
11.2 MHz/
Stop 2.422 GHz

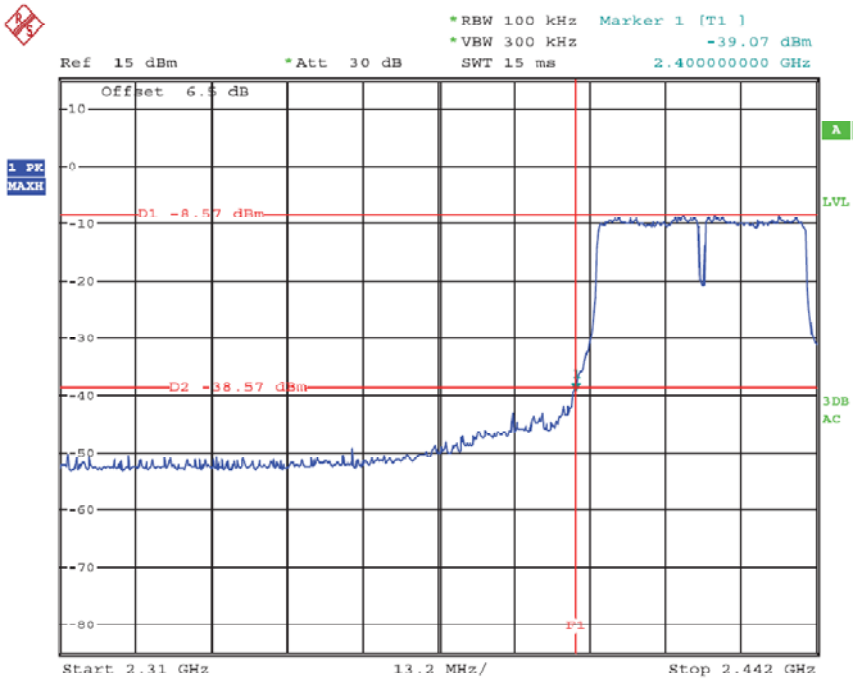

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
-47.48 dBm
2.483596000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
D1 -3.79 dBm
D2 -33.79 dBm
A
LVL
3DB
AC
Start 2.452 GHz
4.8 MHz/
Stop 2.5 GHz

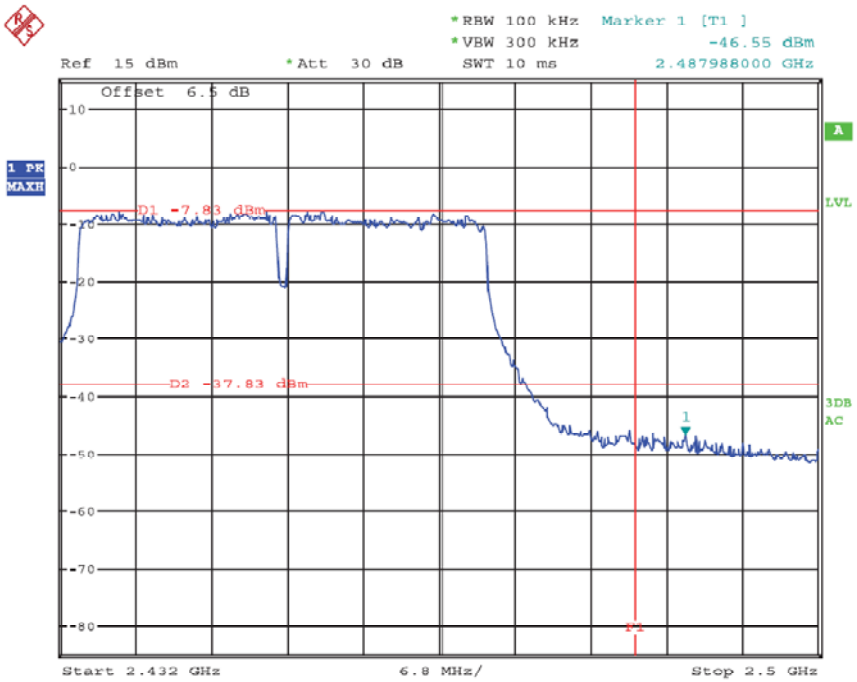
802.11n-HT20


RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
-36.77 dBm
2.400000000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
D1 -3.27 dBm
D2 -33.27 dBm
A
LVL
3DB
AC
Start 2.31 GHz
11.2 MHz/
Stop 2.422 GHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
-47.35 dBm
2.486188000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
D1 -3.7 dBm
D2 -33.7 dBm
A
LVL
3DB
AC
Start 2.452 GHz
4.8 MHz/
Stop 2.5 GHz

802.11n-HT40


RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
-39.07 dBm
2.400000000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
A
LVL
3DB
AC
D1 -8.57 dBm
D2 -38.57 dBm
Start 2.31 GHz
13.2 MHz/
Stop 2.442 GHz


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-46.55 dBm
2.487988000 GHz
Ref 15 dBm
Att 30 dB
Offset 6.5 dB
1 PK
MAXH
A
LVL
3DB
AC
D1 -7.83 dBm
D2 -37.83 dBm
Start 2.432 GHz
6.8 MHz/
Stop 2.5 GHz

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.

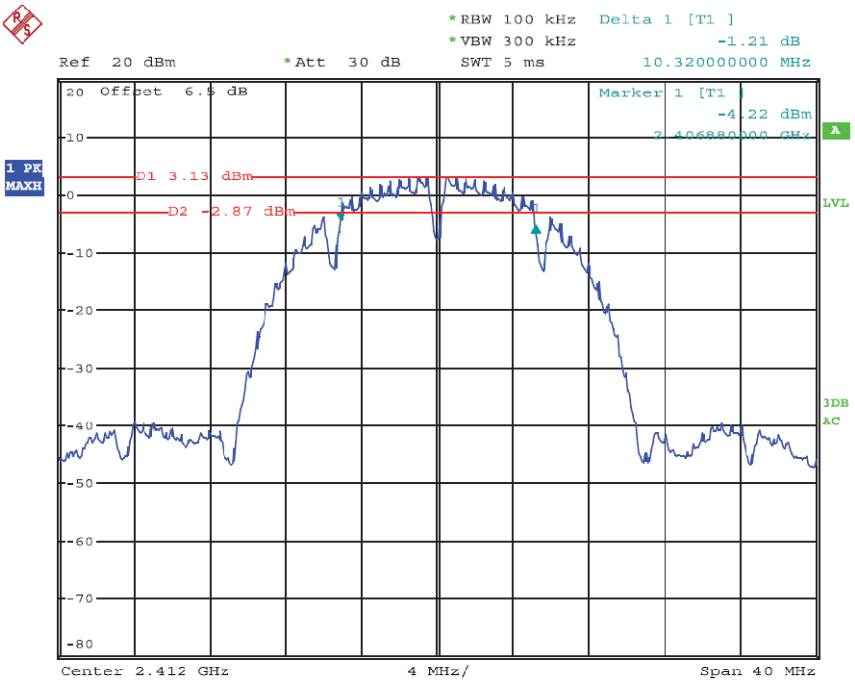
9.1 Test Procedure

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

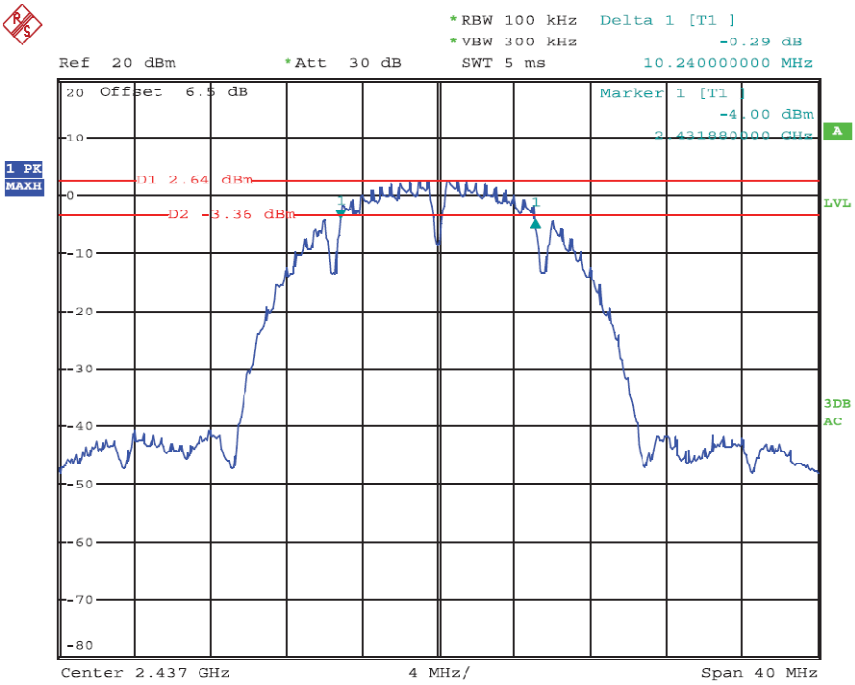
9.2 Test Result

Modulation	Bandwidth(MHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	10.32	10.24	10.24	≥500kHz
802.11g	16.80	16.80	16.72	≥500kHz
802.11n-HT20	17.92	17.92	17.92	≥500kHz
802.11n-HT40	36.96	36.80	36.80	≥500kHz

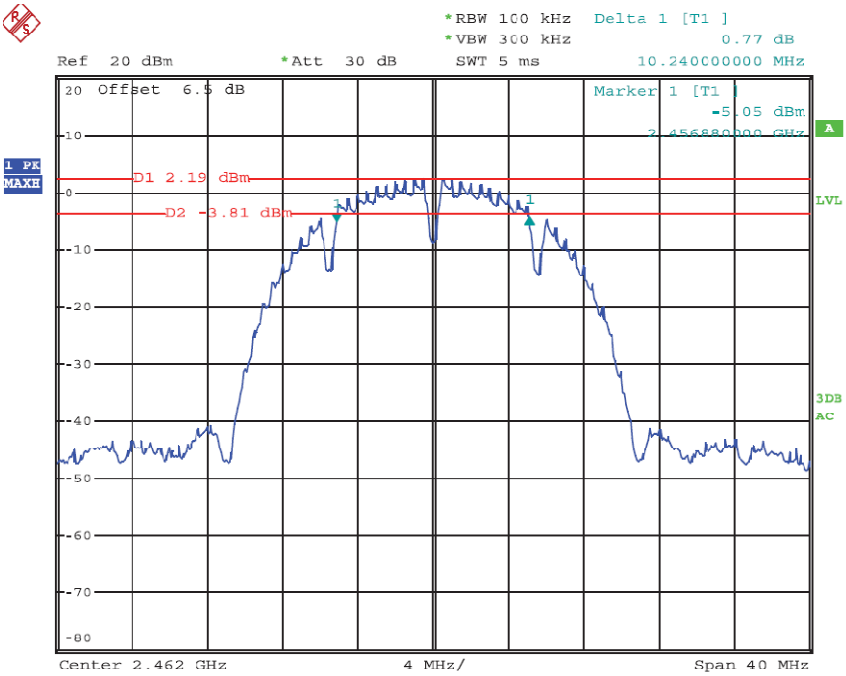
802.11b Low Channel



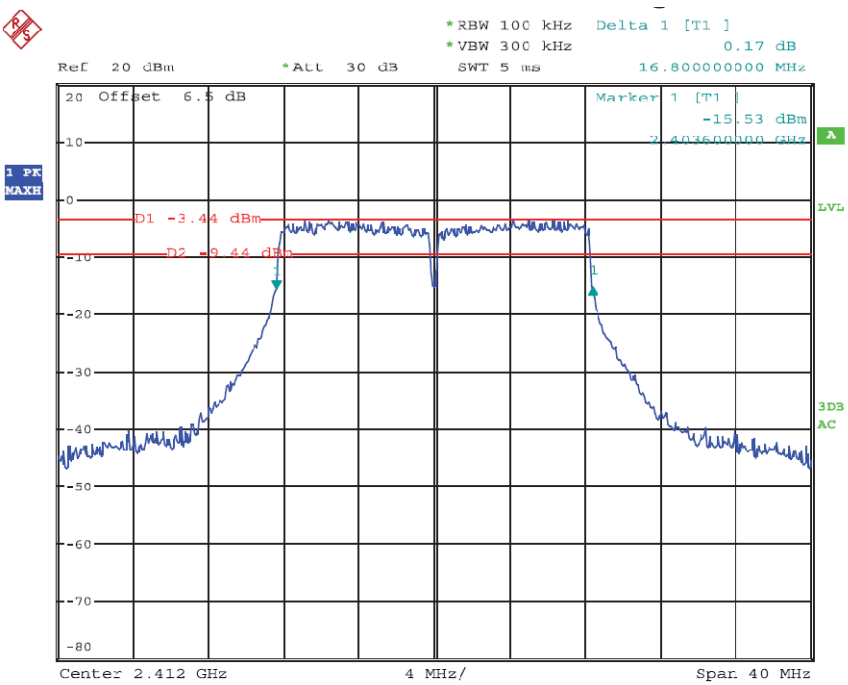
802.11b Middle Channel



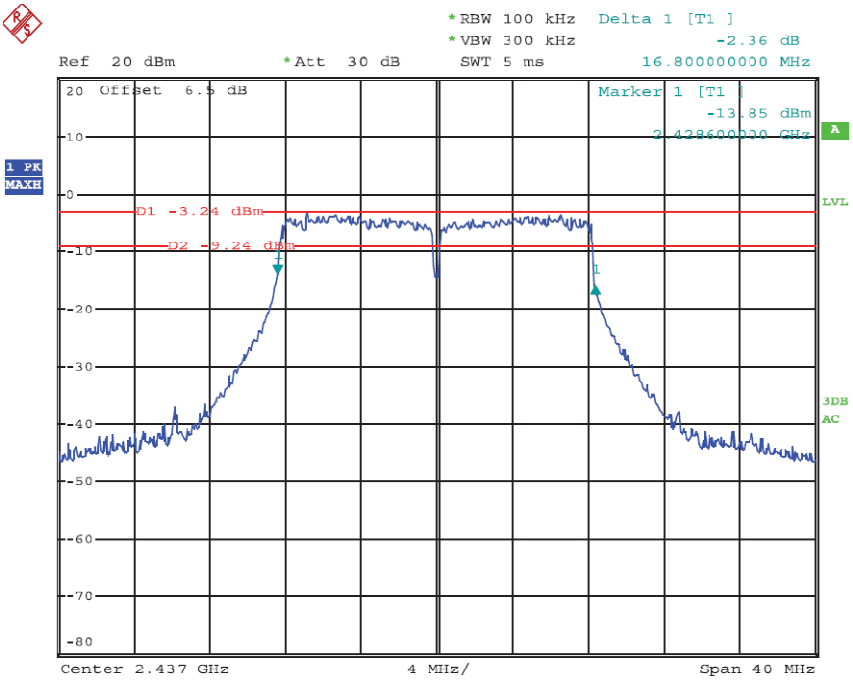
802.11b High Channel



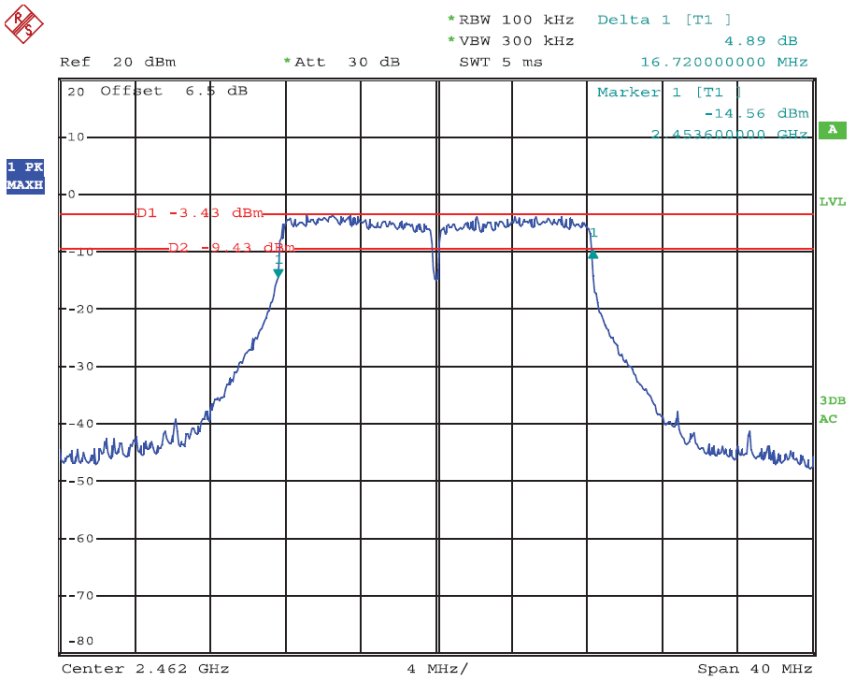
802.11g Low Channel



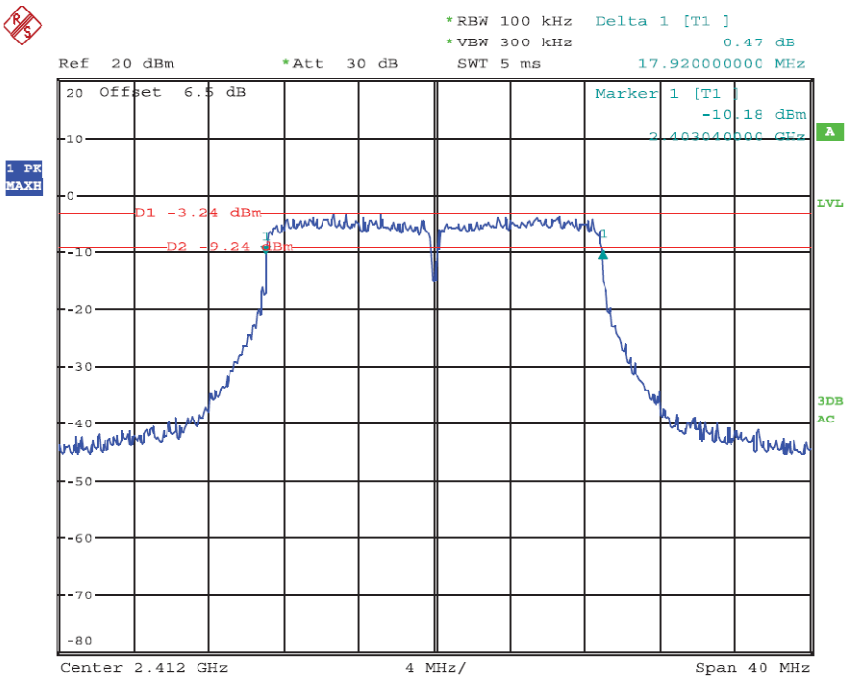
802.11g Middle Channel



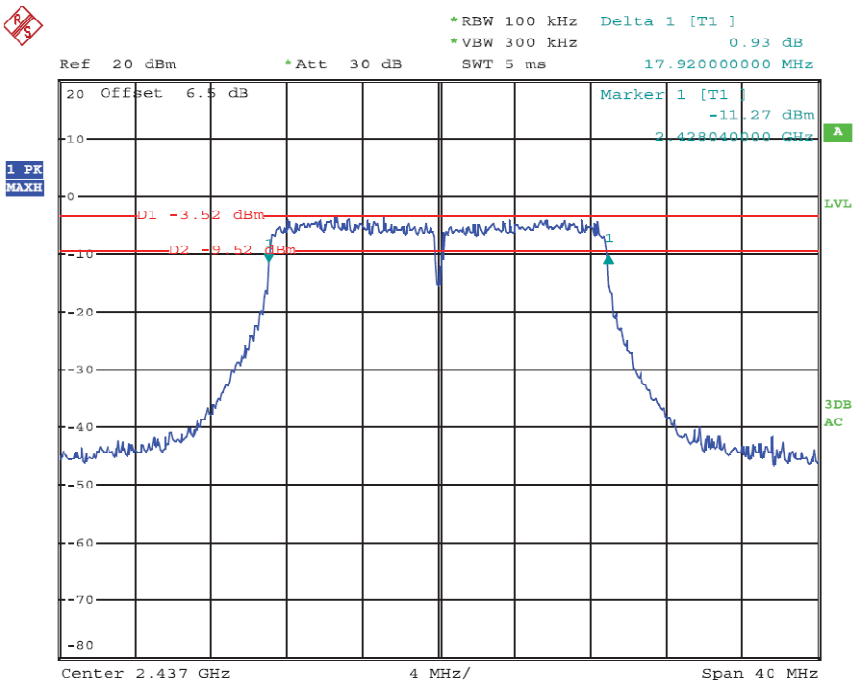
802.11g High Channel



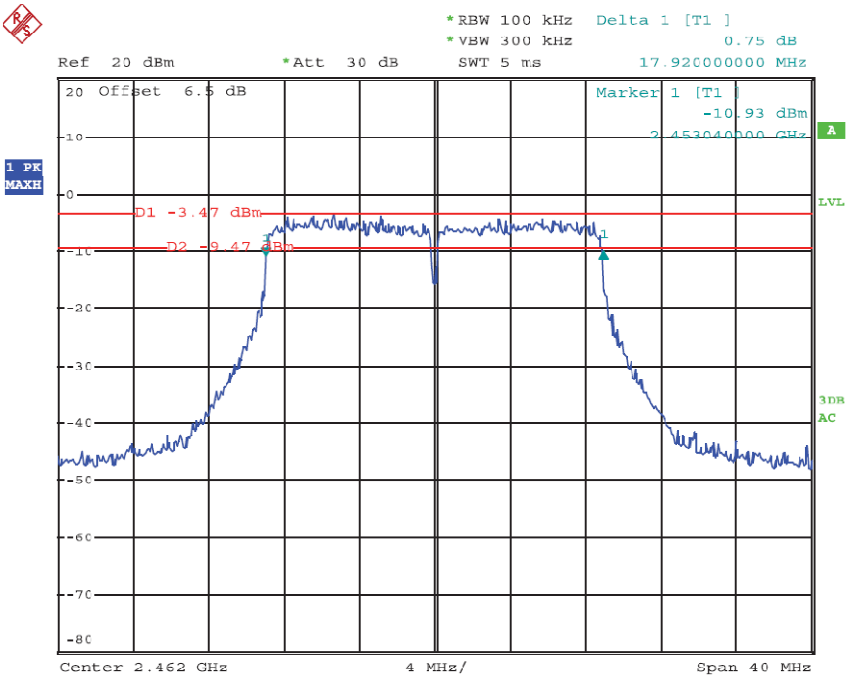
802.11n-HT20 Low Channel



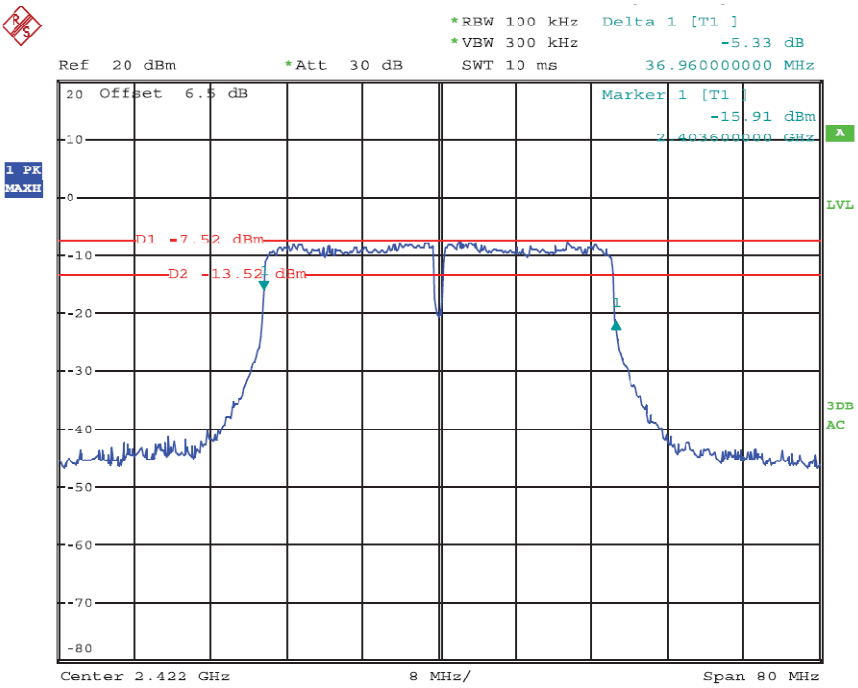
802.11n-HT20 Middle Channel



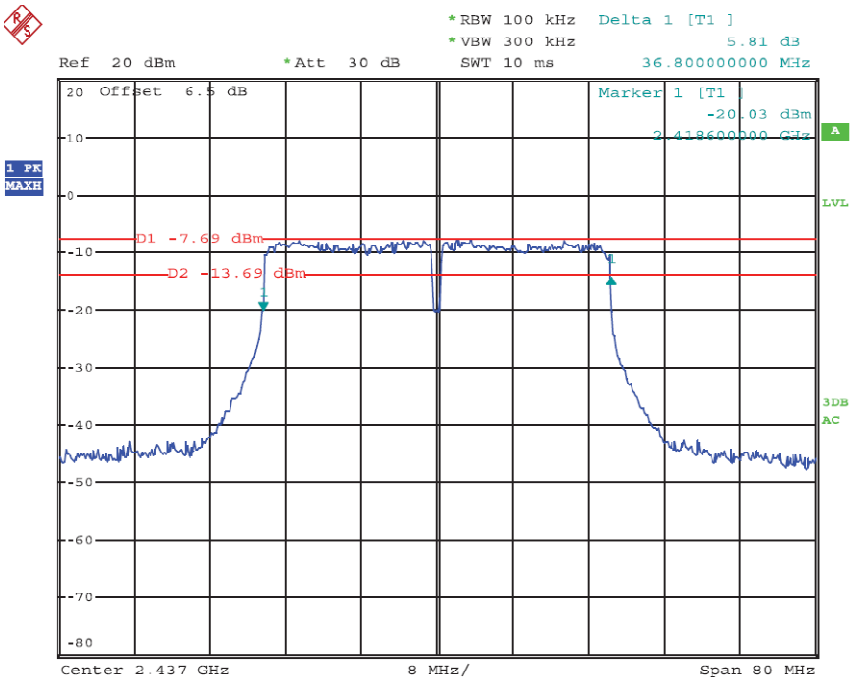
802.11n-HT20 High Channel



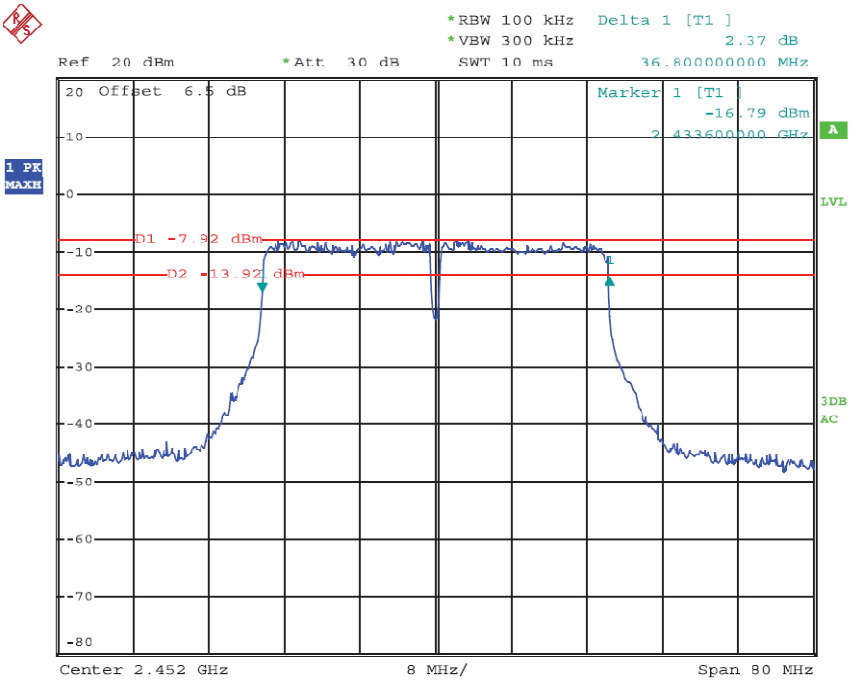
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



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.

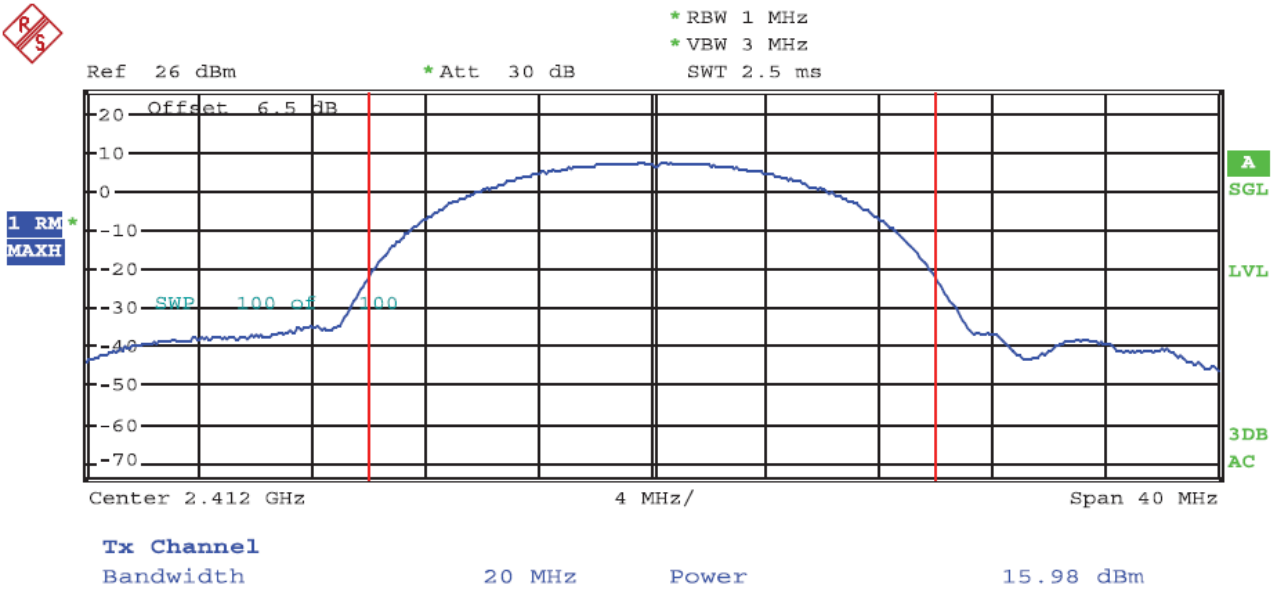
10.1 Test Procedure

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.

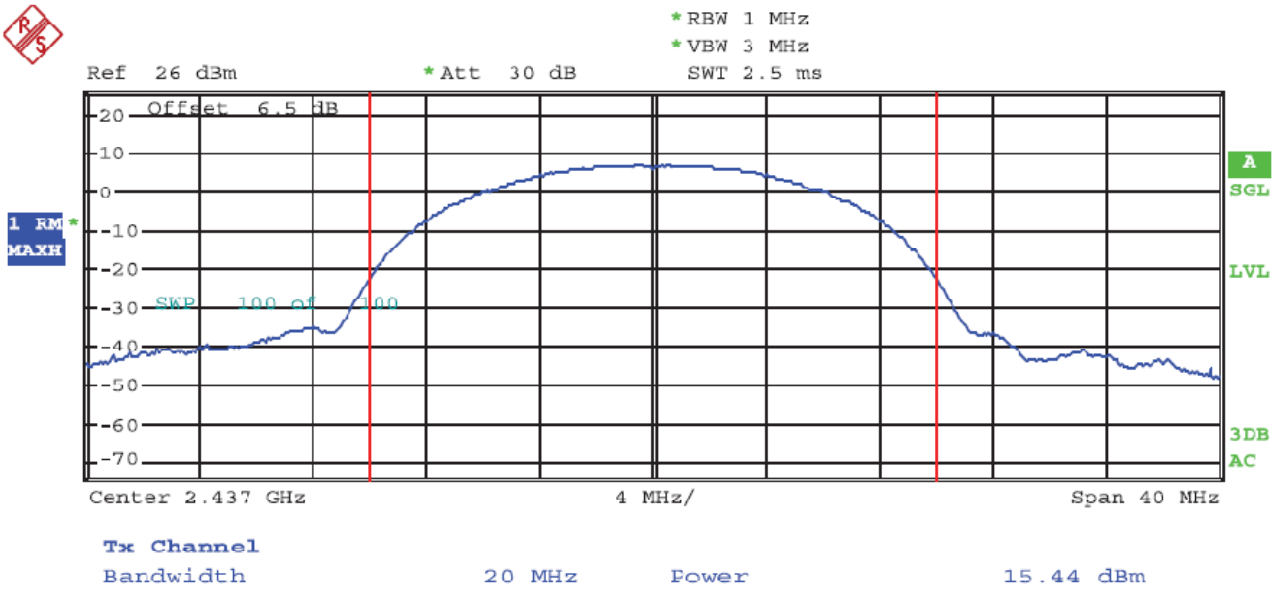
10.2 Test Result

Modulation	Maximum Peak Output Power (dBm)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	15.98	15.44	14.90	1W(30dBm)
802.11g	14.19	13.83	13.47	1W(30dBm)
802.11n-HT20	14.10	14.65	14.07	1W(30dBm)
802.11n-HT40	13.71	13.62	13.35	1W(30dBm)

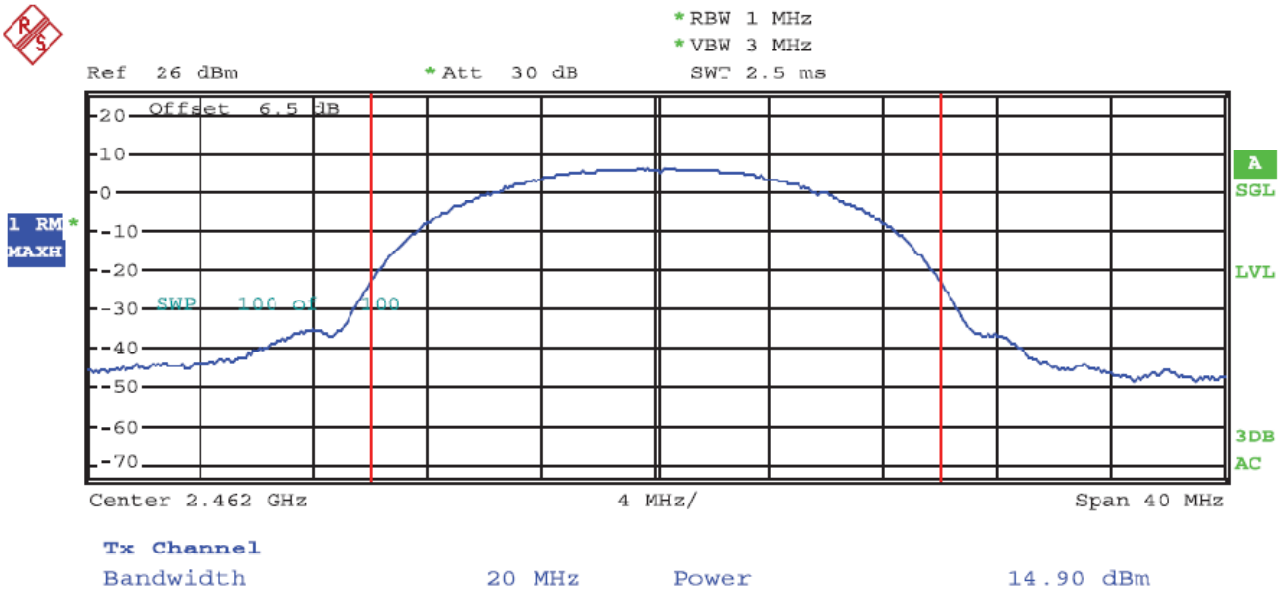
802.11b Low Channel



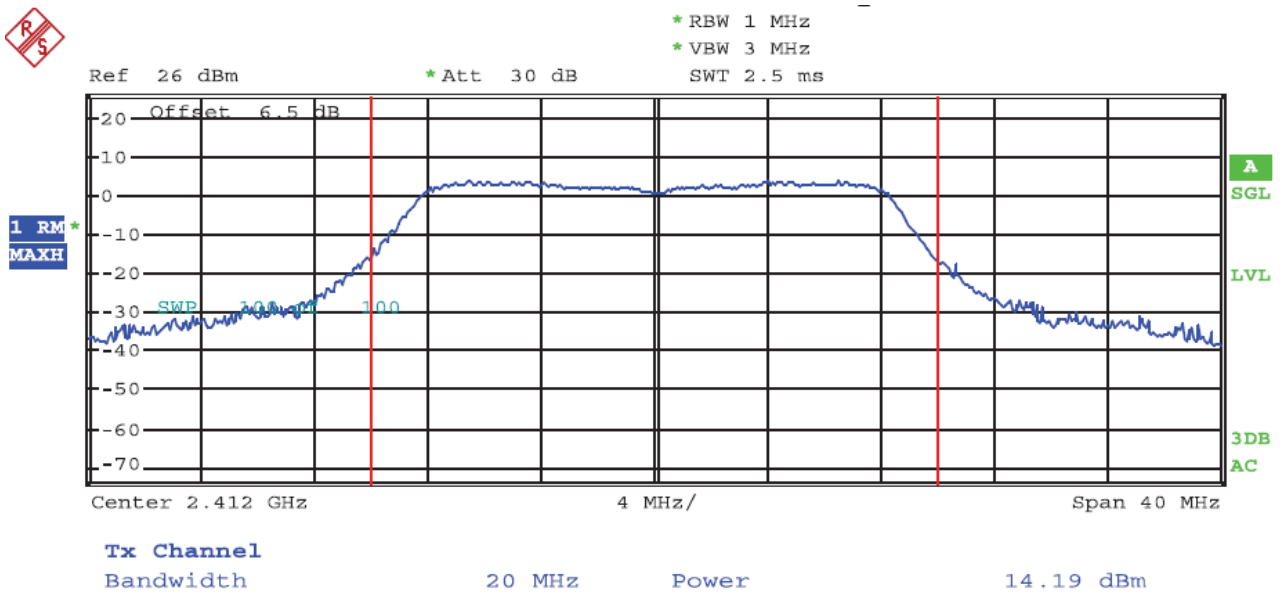
802.11b Middle Channel



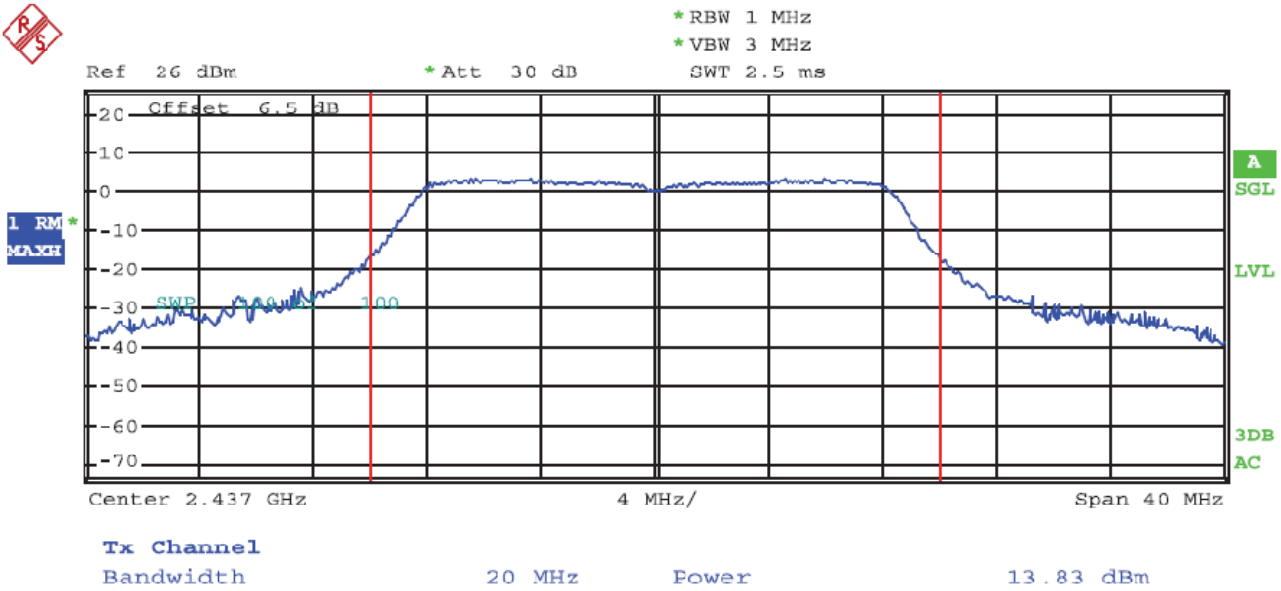
802.11b High Channel



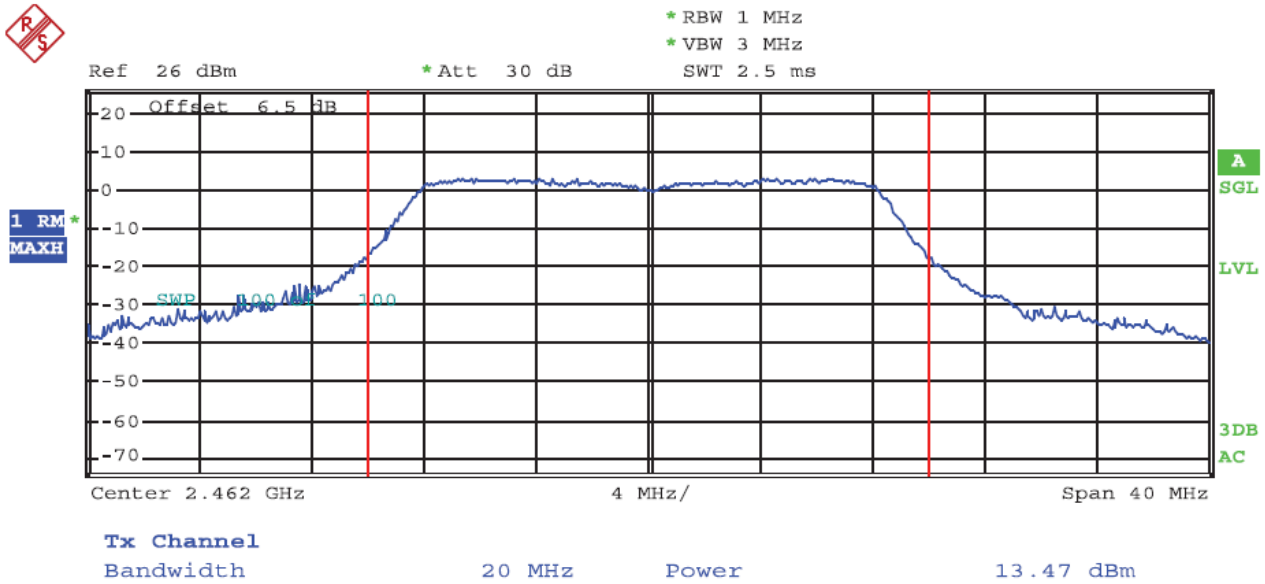
802.11g Low Channel



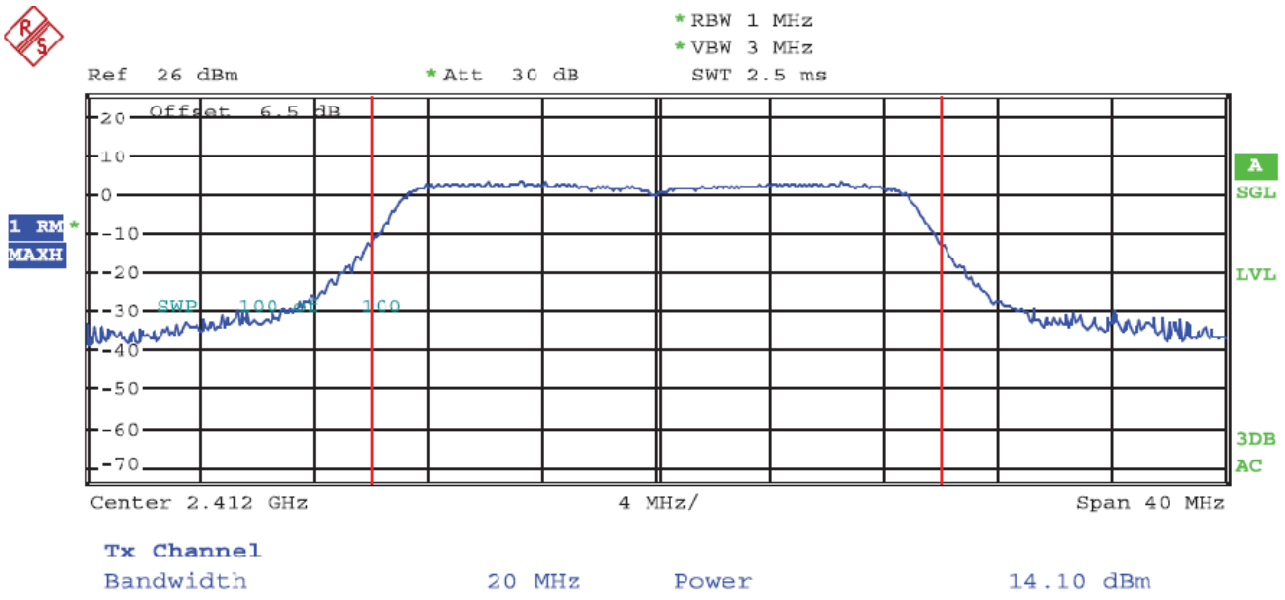
802.11g Middle Channel



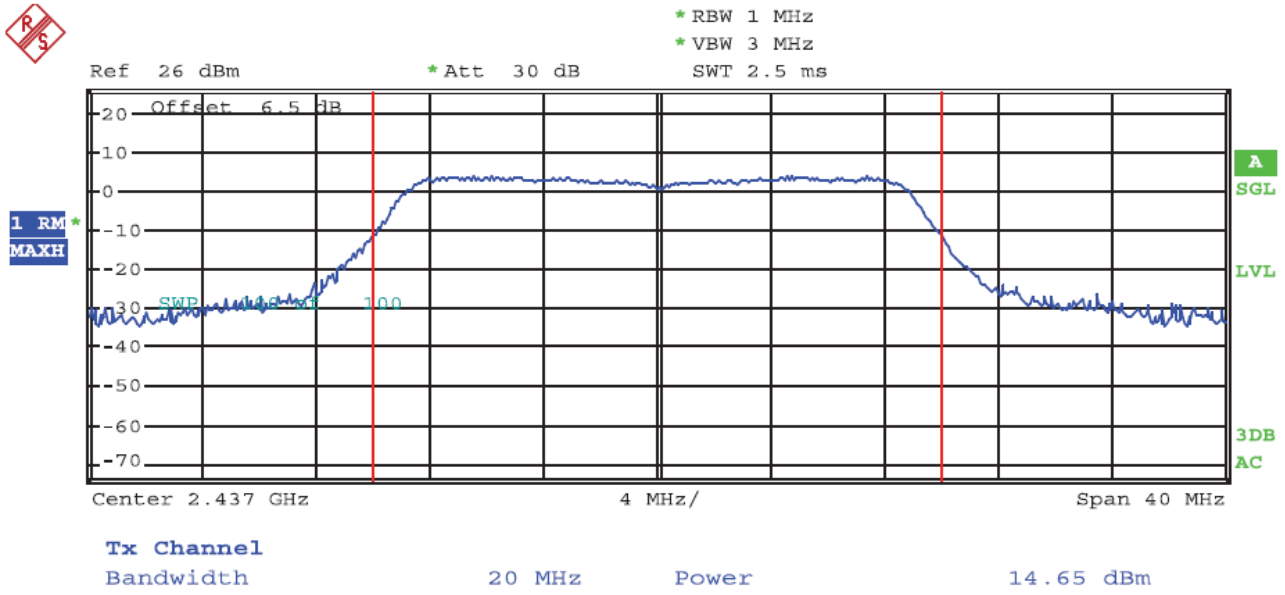
802.11g High Channel



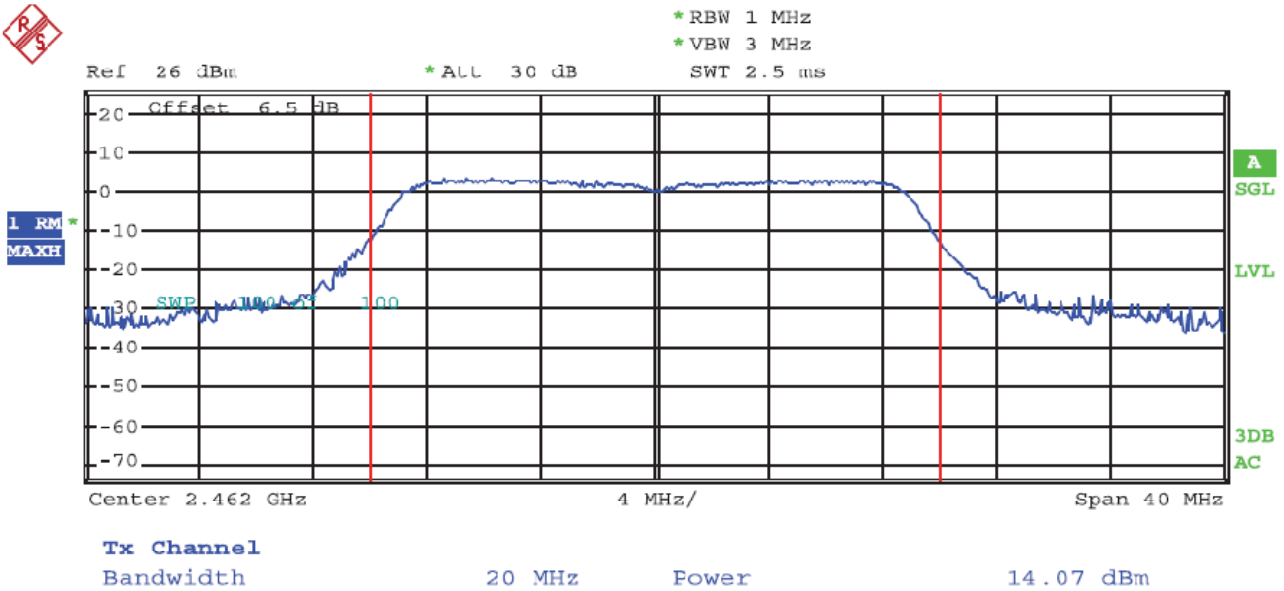
802.11n-HT20 Low Channel



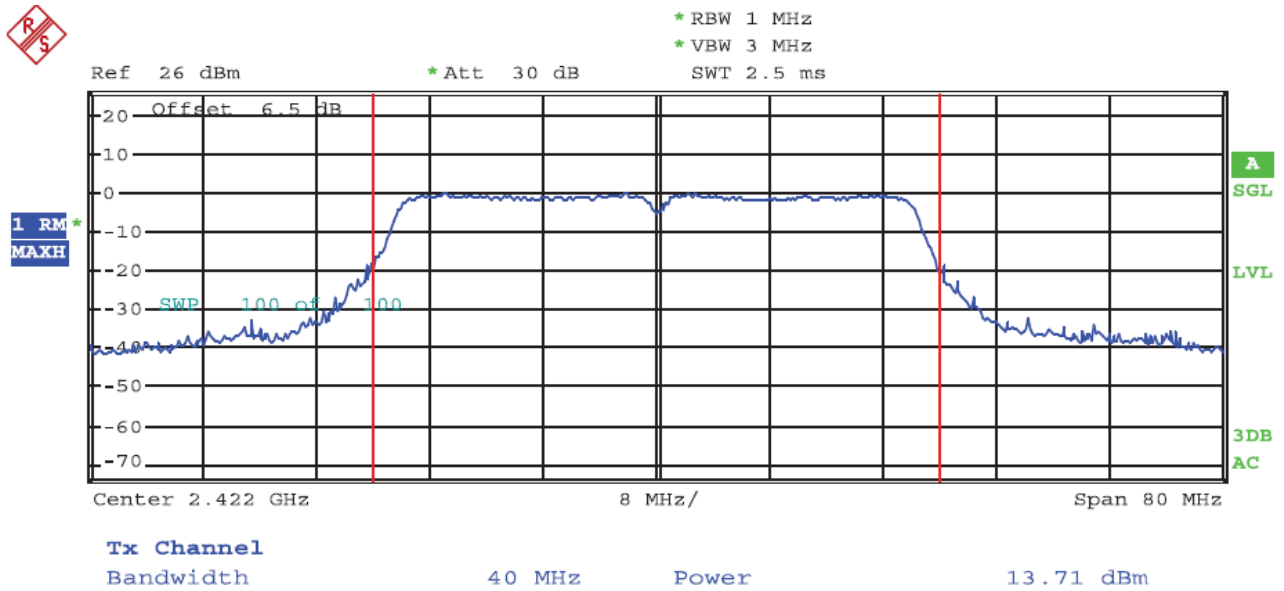
802.11n-HT20 Middle Channel



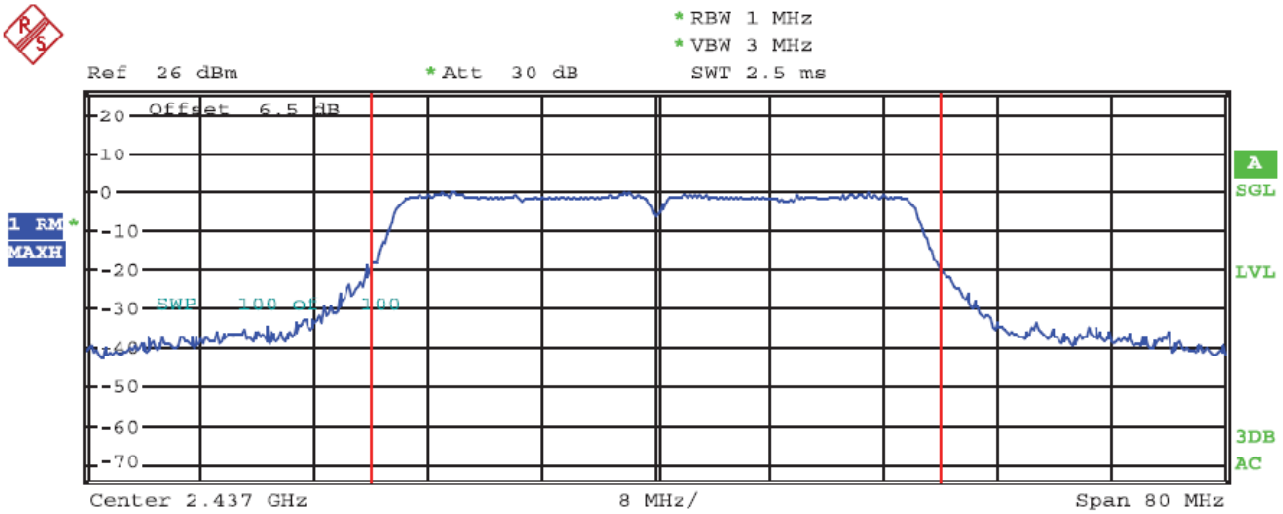
802.11n-HT20 High Channel



802.11n-HT40 Low Channel

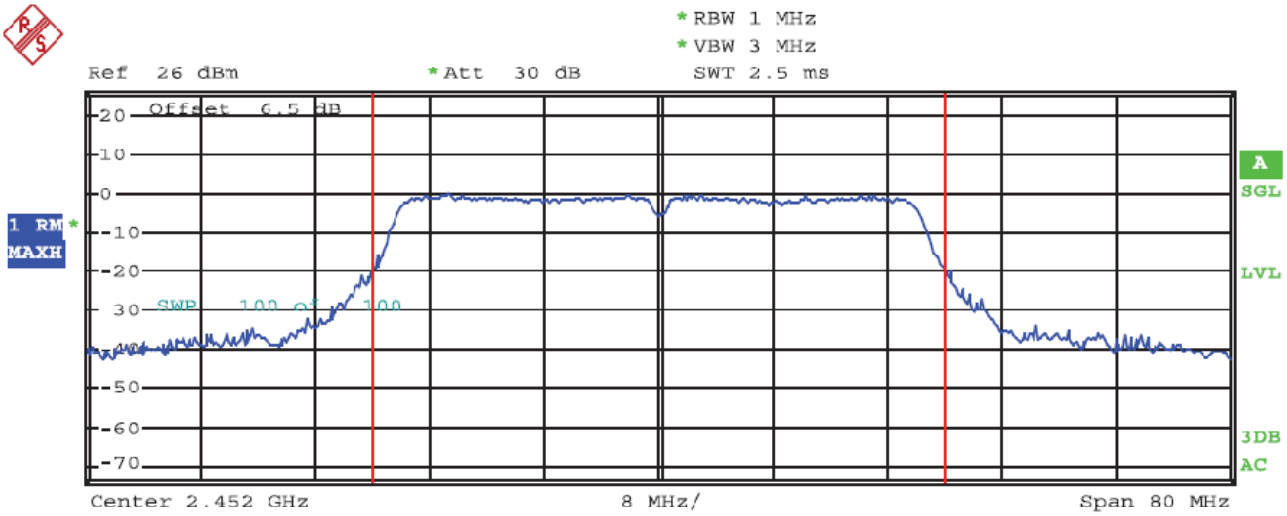


802.11n-HT40 Middle Channel



Tx Channel
Bandwidth 40 MHz Power 13.62 dBm

802.11n-HT40 High Channel



Tx Channel
Bandwidth 40 MHz Power 13.35 dBm

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.

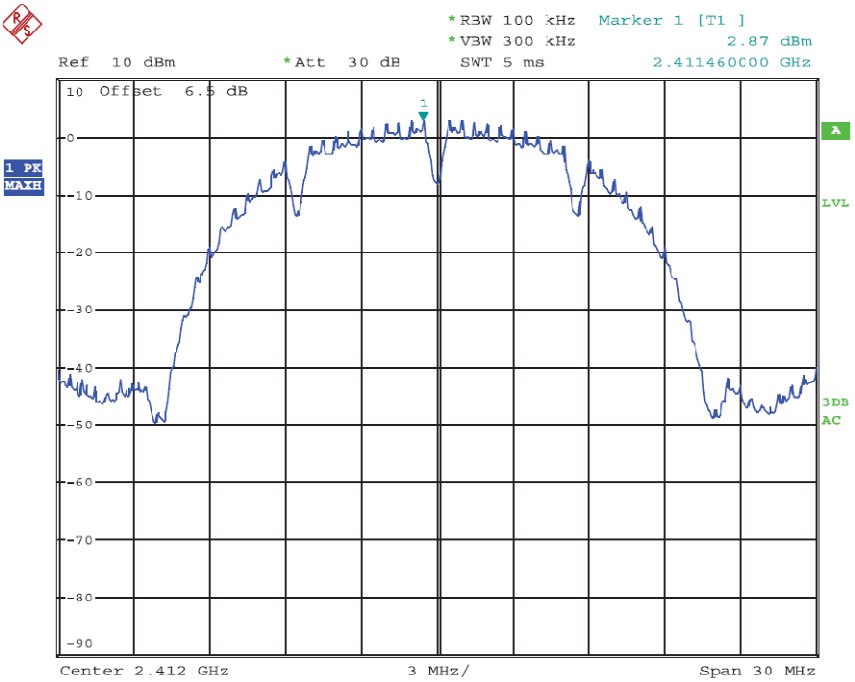
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

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.

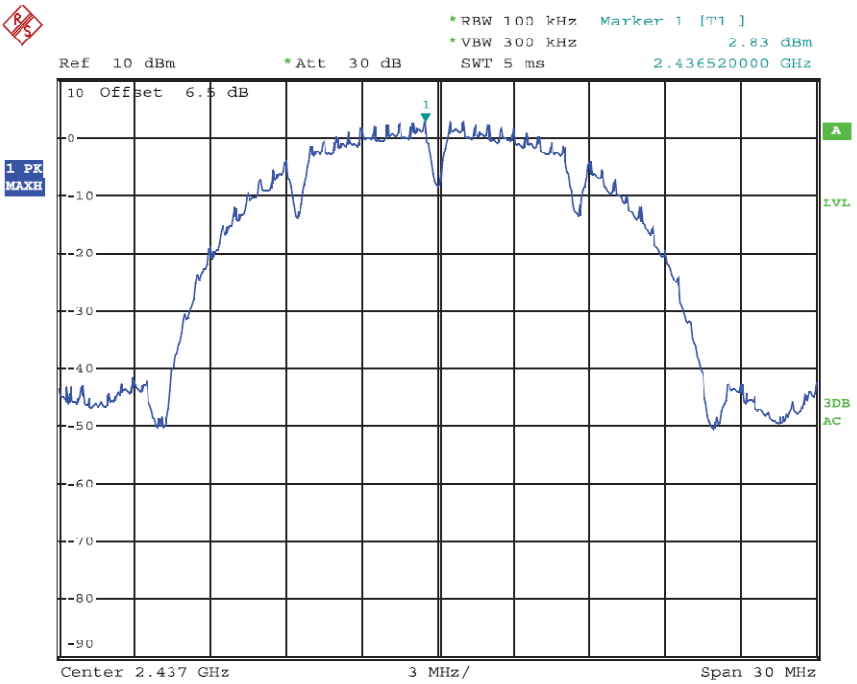
11.2 Test Result

Modulation	Power Spectral density (dBm/3kHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	2.87	2.83	2.63	8dBm/3kHz
802.11g	-3.52	-3.75	-4.25	8dBm/3kHz
802.11n-HT20	-3.73	-3.08	-3.56	8dBm/3kHz
802.11n-HT40	-7.49	-7.74	-7.78	8dBm/3kHz

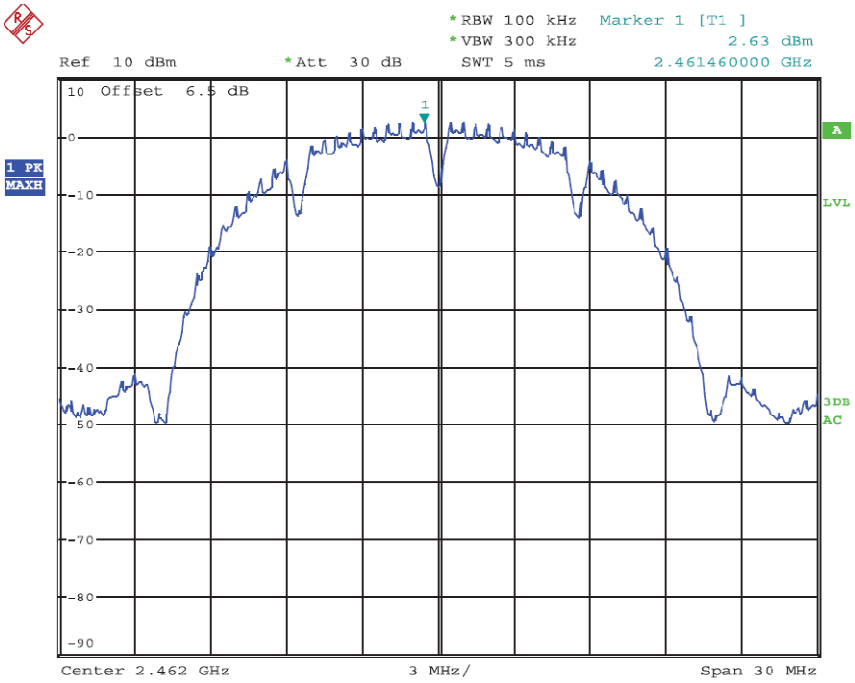
802.11b Low Channel



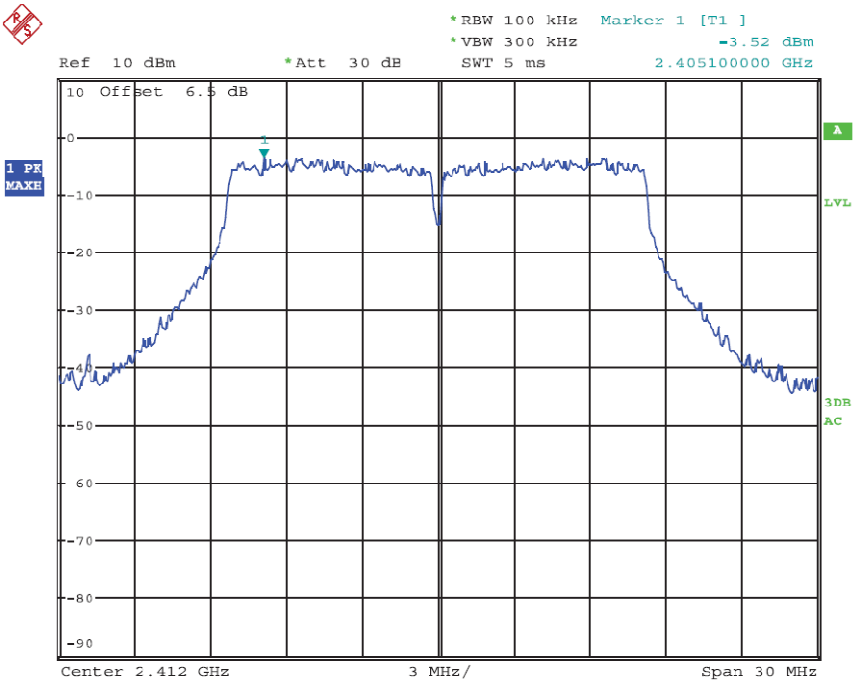
802.11b Middle Channel



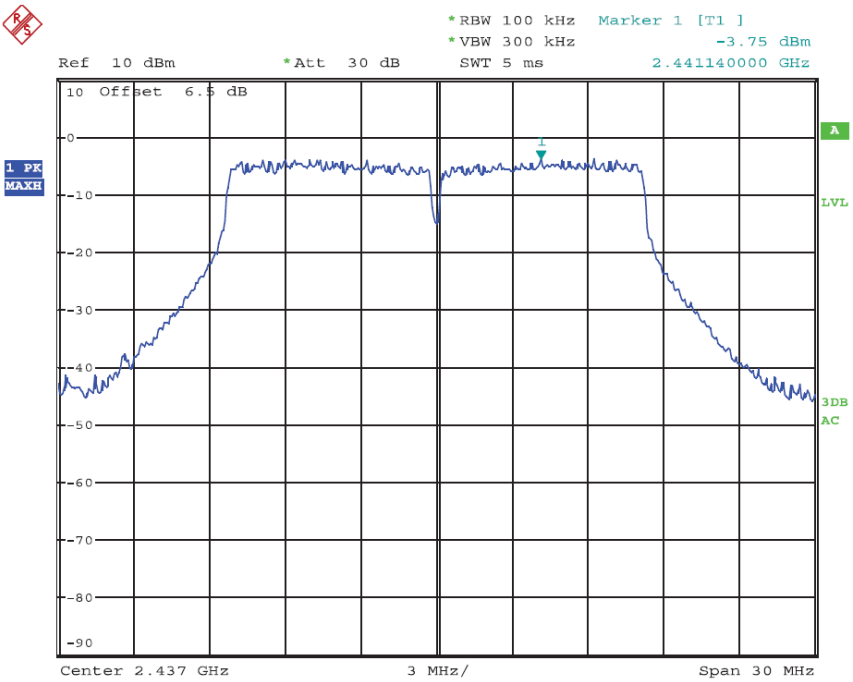
802.11b High Channel



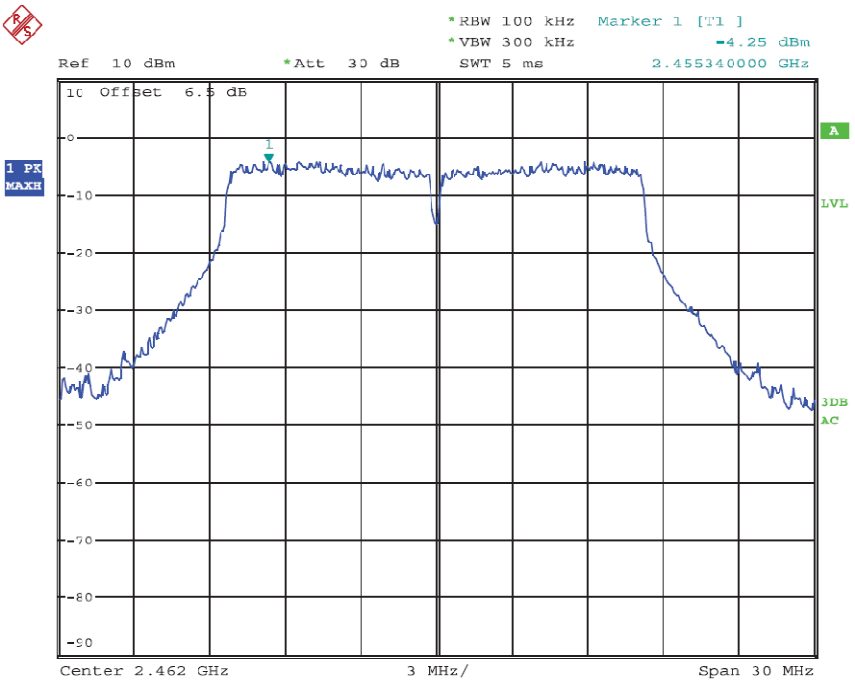
802.11g Low Channel



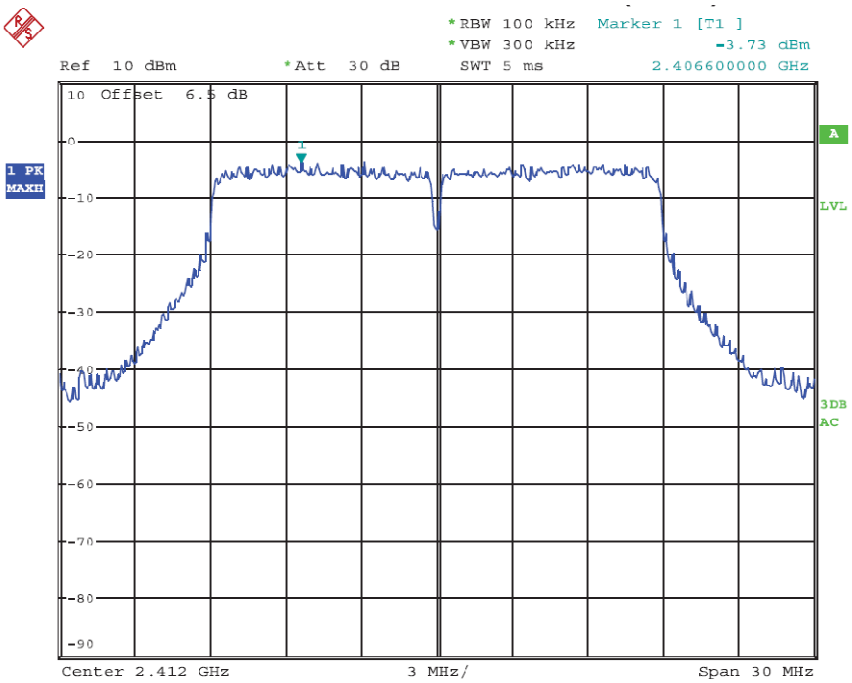
802.11g Middle Channel



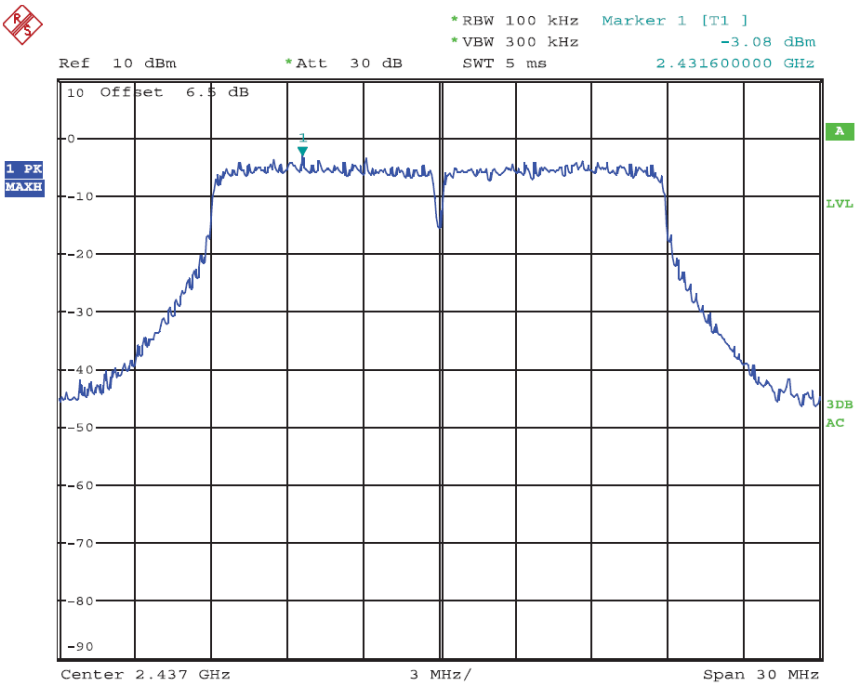
802.11g High Channel



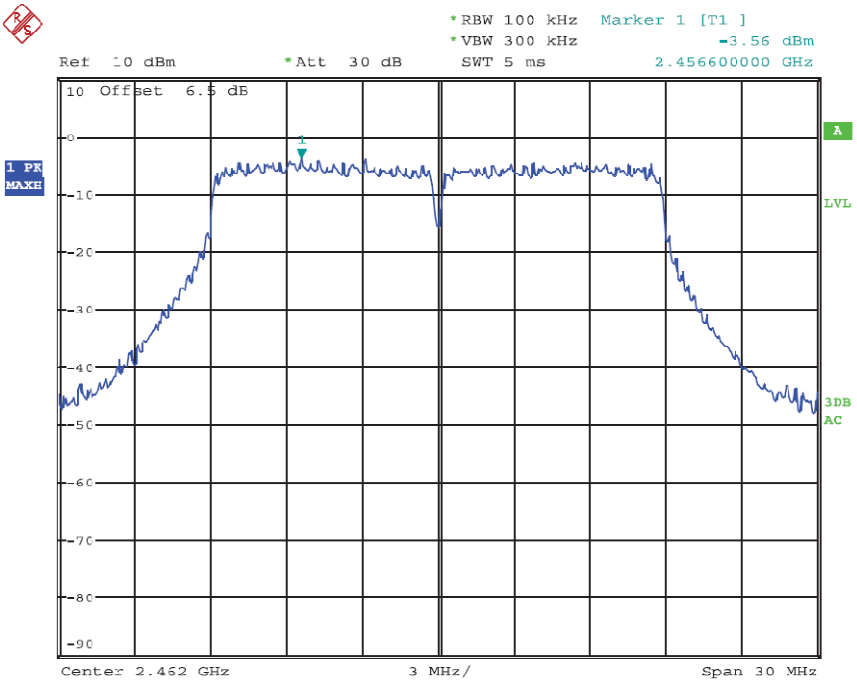
802.11n-HT20 Low Channel



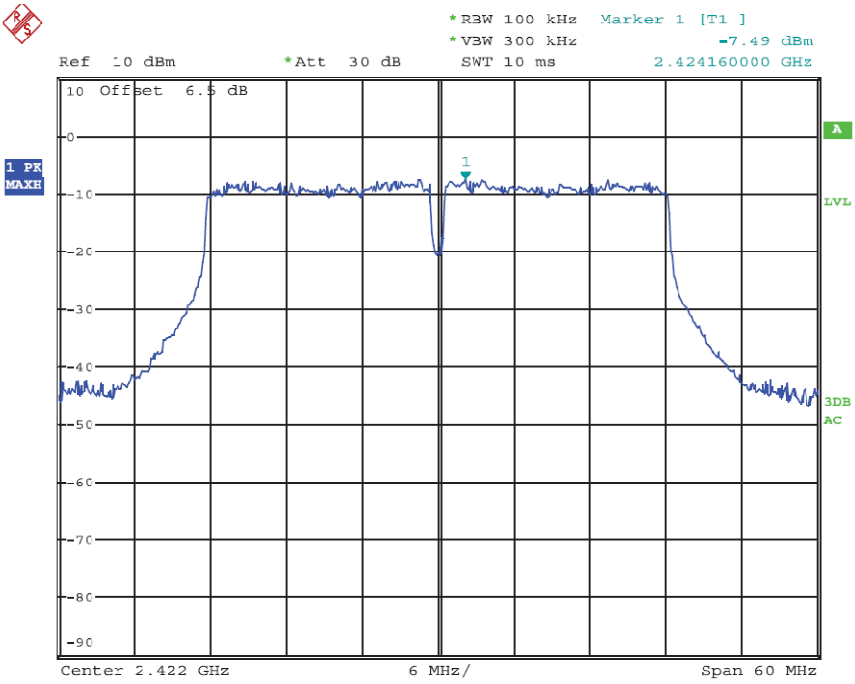
802.11n-HT20 Middle Channel



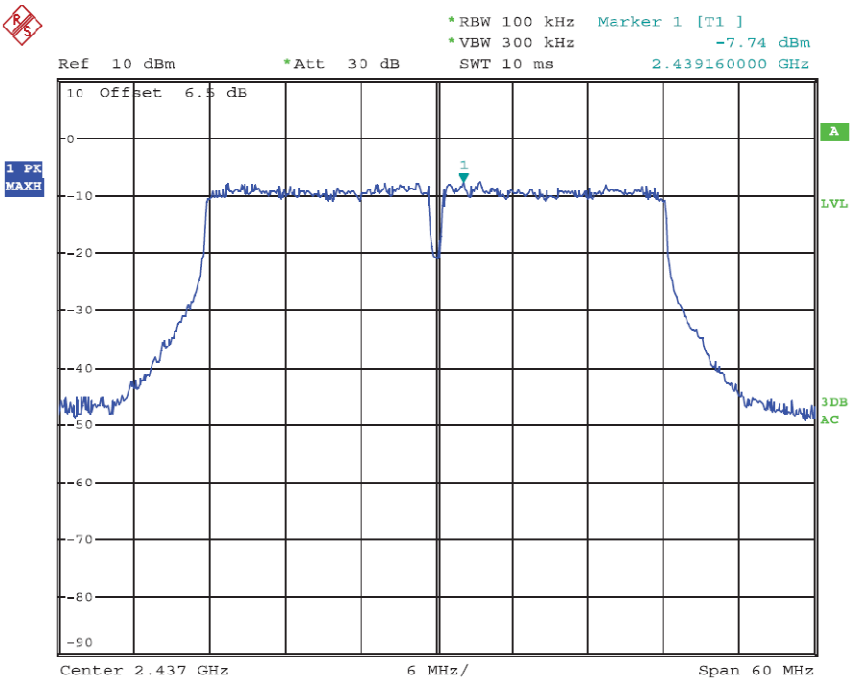
802.11n-HT20 High Channel



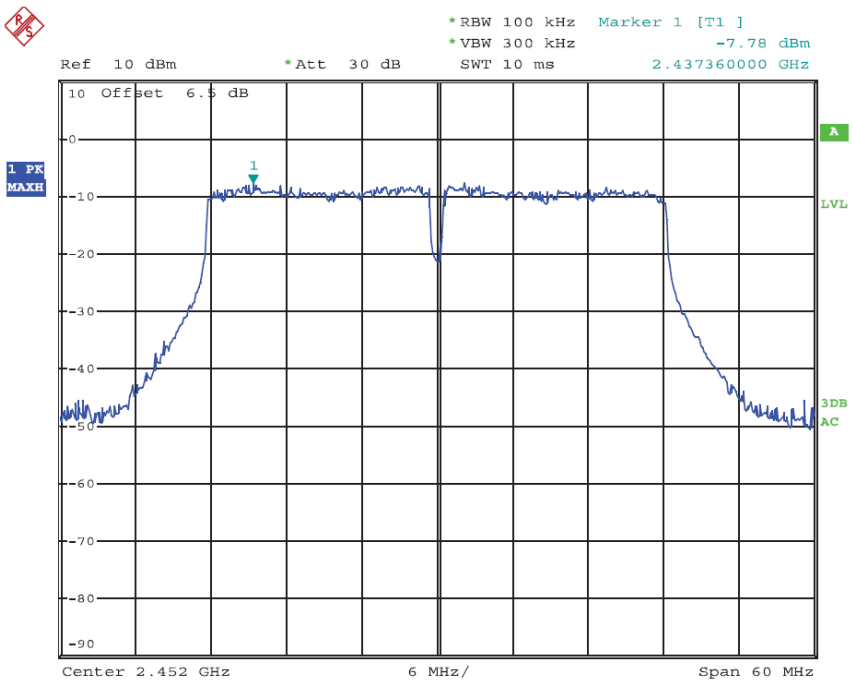
802.11n-HT40 Low Channel



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.

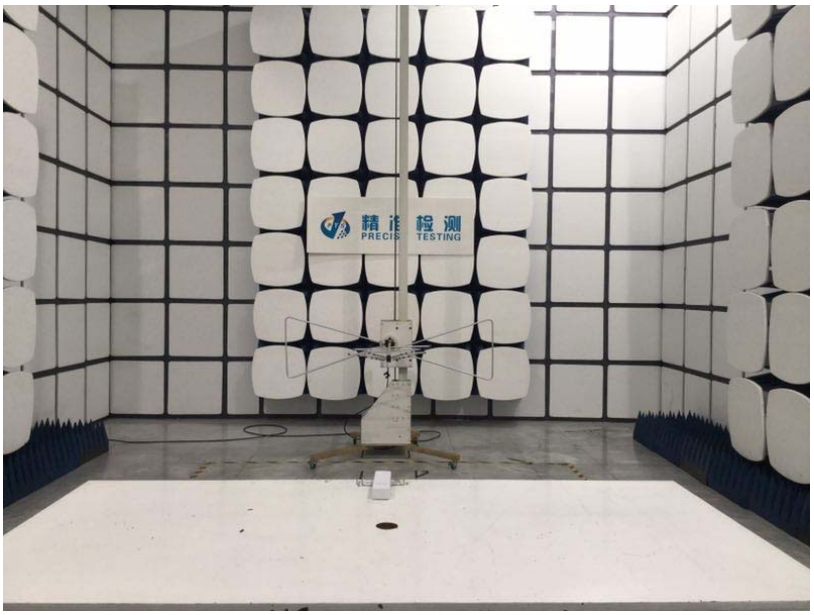
12.2 Result

The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 3dBi and meets the requirement.

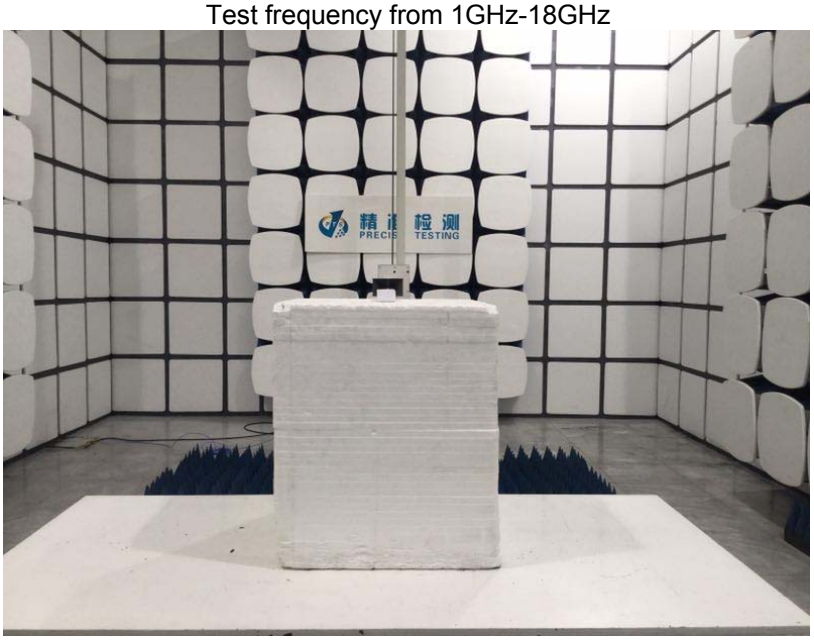
13 Test Setup

Conducted Emissions

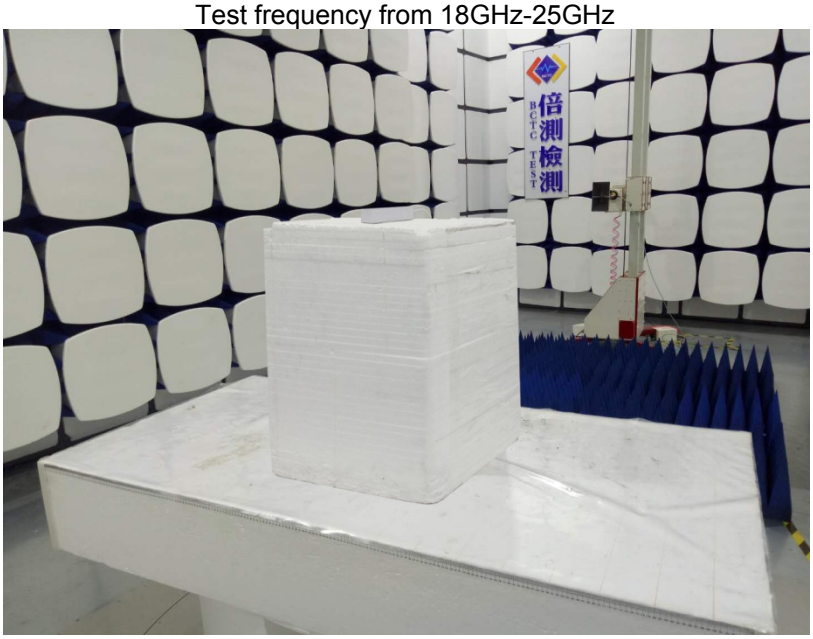
Radiated Spurious Emissions
From 30MHz-1000MHz



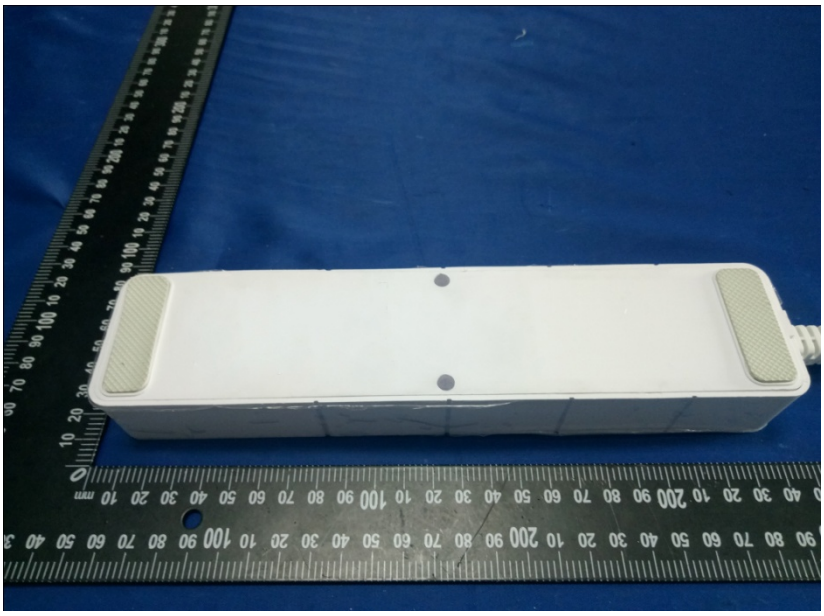
Test frequency from 1GHz-18GHz

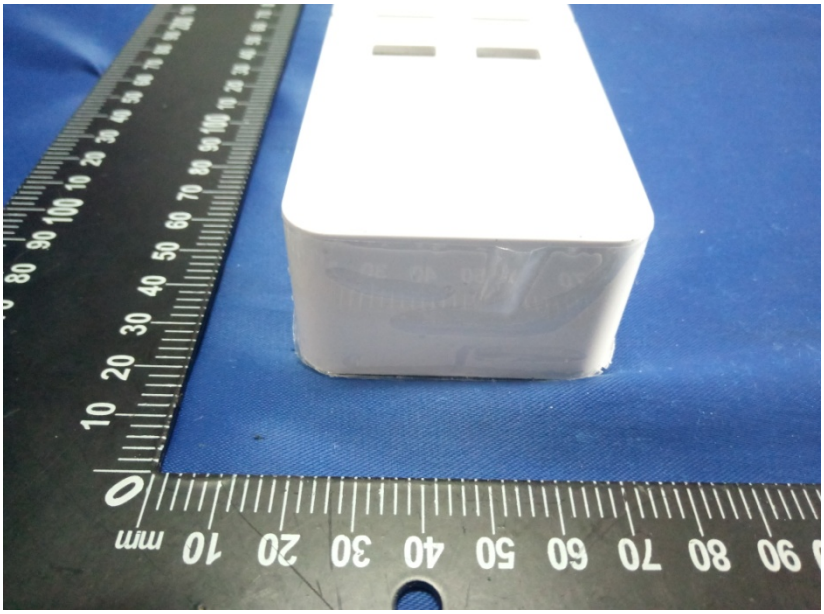


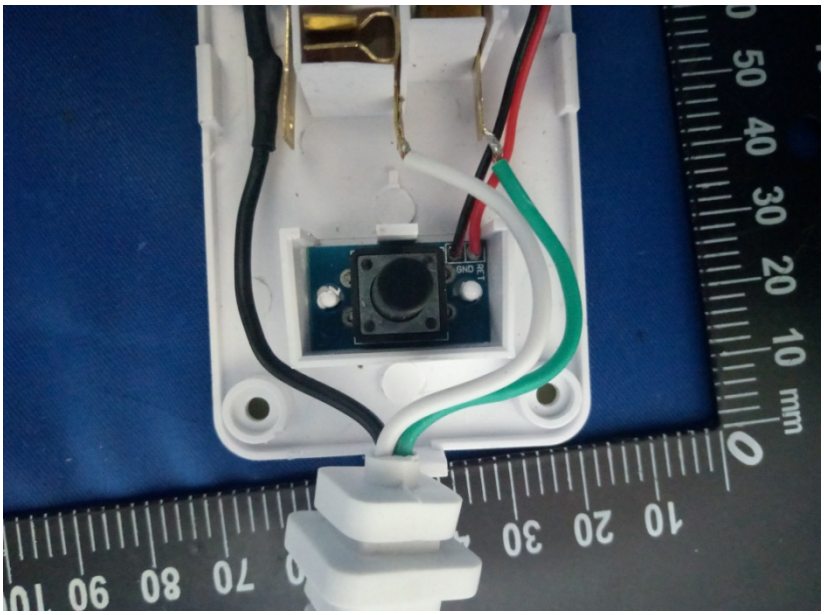
Test frequency from 18GHz-25GHz

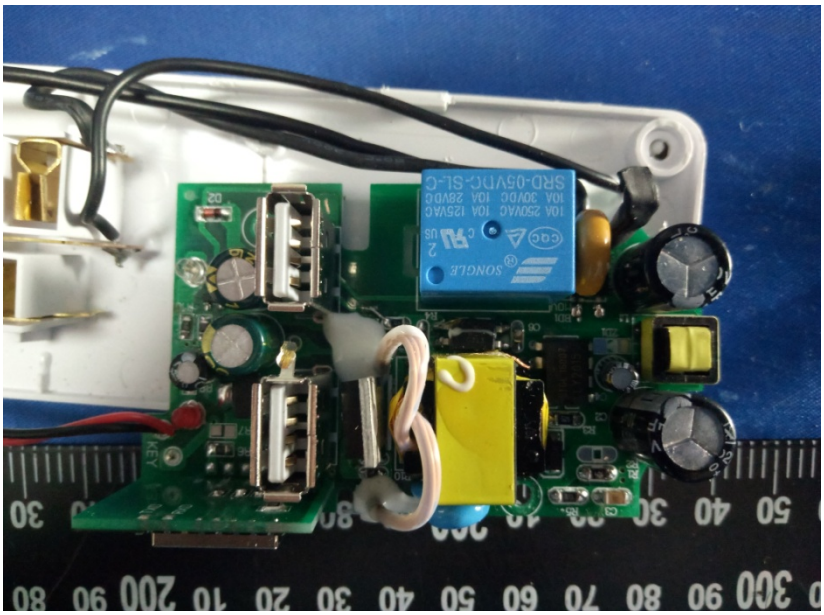


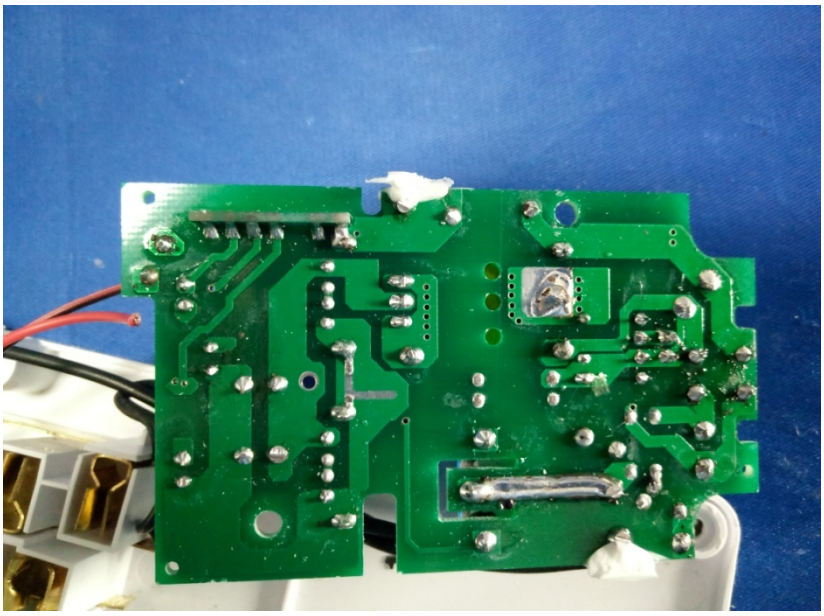
14 EUT Photos

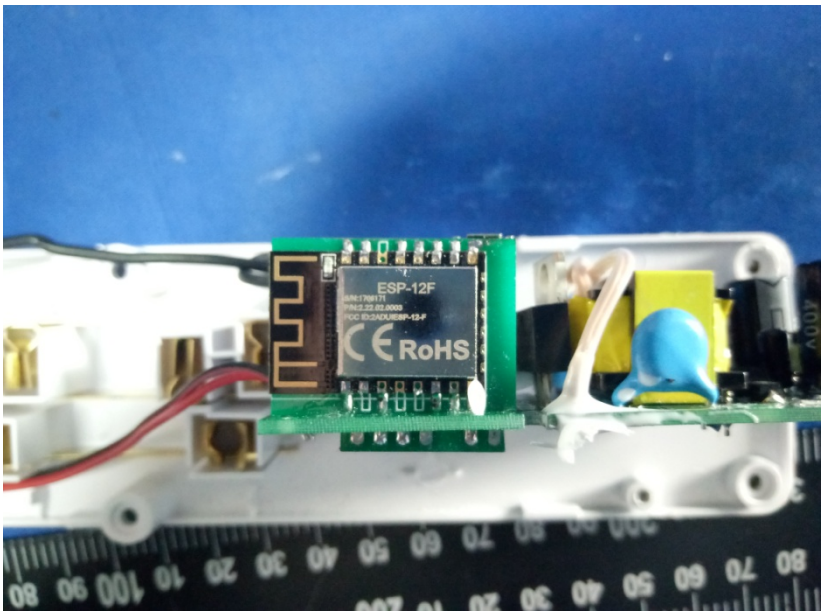


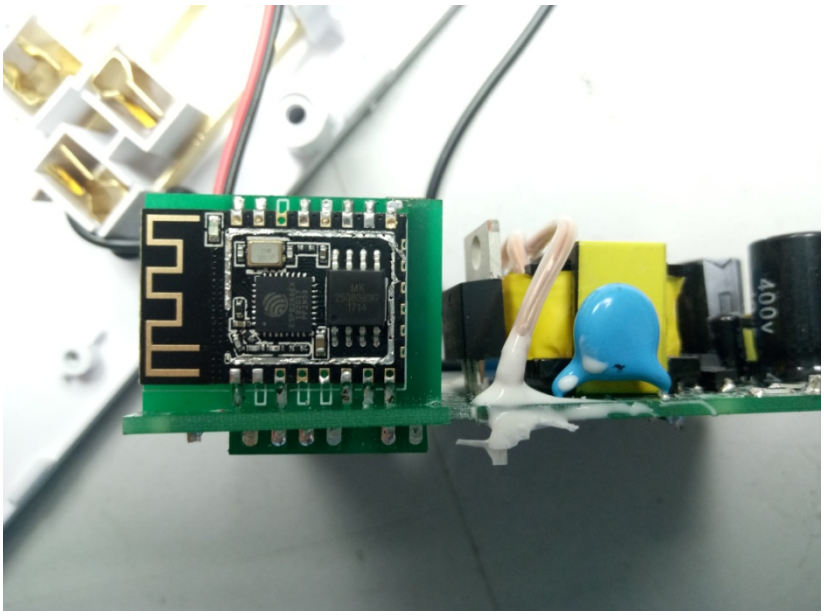









ESP-12F
RoHS



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