



FCC TEST REPORT

Test report
On Behalf of
Dongguan MaiJia Intelligent Technology Co.,Ltd.
For
USB Smart Plug
Model No.: MJ-VU01,MJ-VU02, MJ-VU03, MJ-VU04 MJ-VU05,
MJ-VU06

FCC ID: 2ANJ7-VU01

Prepared for : Dongguan MaiJia Intelligent Technology Co.,Ltd.
Room 202,Floor 2,Building A,No.2 of ManYuan Street,Hengtang
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Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.
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TEST REPORT

Applicant's name : Dongguan MaiJia Intelligent Technology Co.,Ltd.
Address : Room 202,Floor 2,Building A,No.2 of ManYuan Street,Hengtang
 Community,Tangxia Town,Dongguan City,China
Manufacture's Name..... : Dongguan MaiJia Intelligent Technology Co.,Ltd.
Address : Room 202,Floor 2,Building A,No.2 of ManYuan Street,Hengtang
 Community,Tangxia Town,Dongguan City,China

Product description

Trade Mark: /
Product name : USB Smart Plug
Model and/or type reference : MJ-VU01,MJ-VU02, MJ-VU03, MJ-VU04 MJ-VU05, MJ-VU06
Standards : FCC Rules and Regulations Part 15 Subpart C Section 15.247
 ANSI C63.10: 2013

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Date of Test :
Date (s) of performance of tests : Apr. 28, 2018 ~ May.15,2018
Date of Issue..... : May.15, 2018
Test Result..... : **Pass**

Testing Engineer : Gary Qian
 (Gary Qian)

Technical Manager : Eden Hu
 (Eden Hu)

Authorized Signatory : Jason Zhou
 (Jason Zhou)



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1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
POWER SPECTRAL DENSITY	COMPLIANT
PEAK OUTPUT POWER _{Peak}	COMPLIANT
OUT OF BAND EMISSIONS	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 TEST FACILITY

Test Firm : Shenzhen HUAKE Testing Technology Co., Ltd.

Address : 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty	
Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2



1.4 Test Description

Test Specification clause	Test case	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions radiated	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions Radiated < 30 MHz	-/-	802.11b	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Remark:

The measurement uncertainty is not included in the test result.

NA = Not Applicable; NP = Not Performed

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.



Test Items	Mode	Data Rate	Channel
Maximum Peak Conducted Output Power	11b/DSSS	1 Mbps	1/6/11
Power Spectral Density	11g/OFDM	6 Mbps	1/6/11
6dB Bandwidth	11n(20MHz)/OFDM	6.5Mbps	1/6/11
Spurious RF conducted emission			
Radiated Emission 9kHz~1GHz& Radiated Emission 1GHz~10th Harmonic			
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	USB Smart Plug
Model Name	MJ-VU01
Serial Model	MJ-VU02, MJ-VU03, MJ-VU04 MJ-VU05, MJ-VU06
FCC ID	2ANJ7-VU01
Antenna Type	Internal antenna
Antenna Gain	3.0 dBi
Operation frequency	802.11b/g/n 20:2412~2462 MHz
Number of Channels	802.11b/g/n20: 11CH
Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Power Rating	AC 100-240V,50/60Hz
HW Version	V1.0.0
SW Version	0.0.8



2.1.1 Carrier Frequency of Channels

Channel List for 802.11b/g/n(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

Operation of EUT during testing

Operating Mode

The mode is used: **Transmitting mode for 802.11b/g/n(20MHz)**

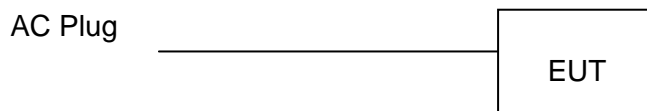
Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

2.2 DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing and Radiation and Above1GHz Radiation testing:





2.3 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2017	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2017	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2017	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2017	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 28, 2017	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 28, 2017	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2017	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2017	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2017	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2017	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2017	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2017	3 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

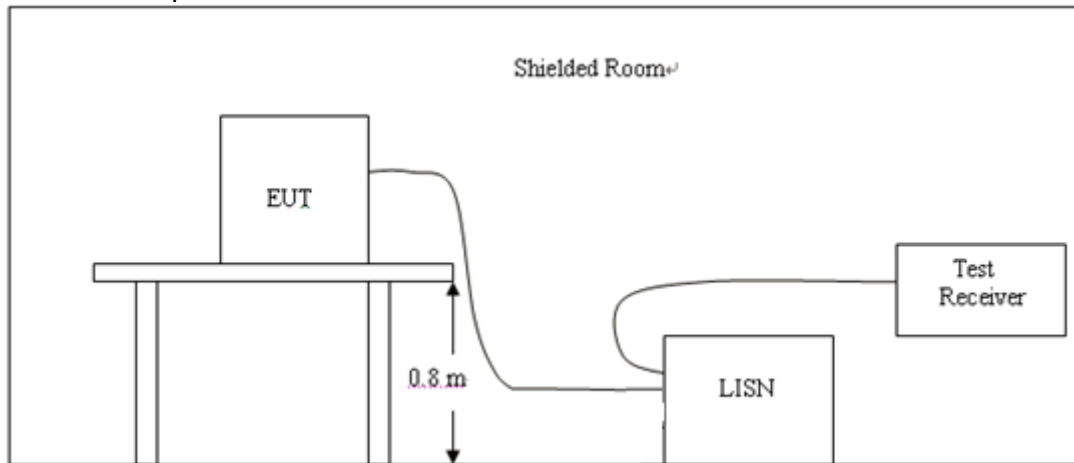
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dBµV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

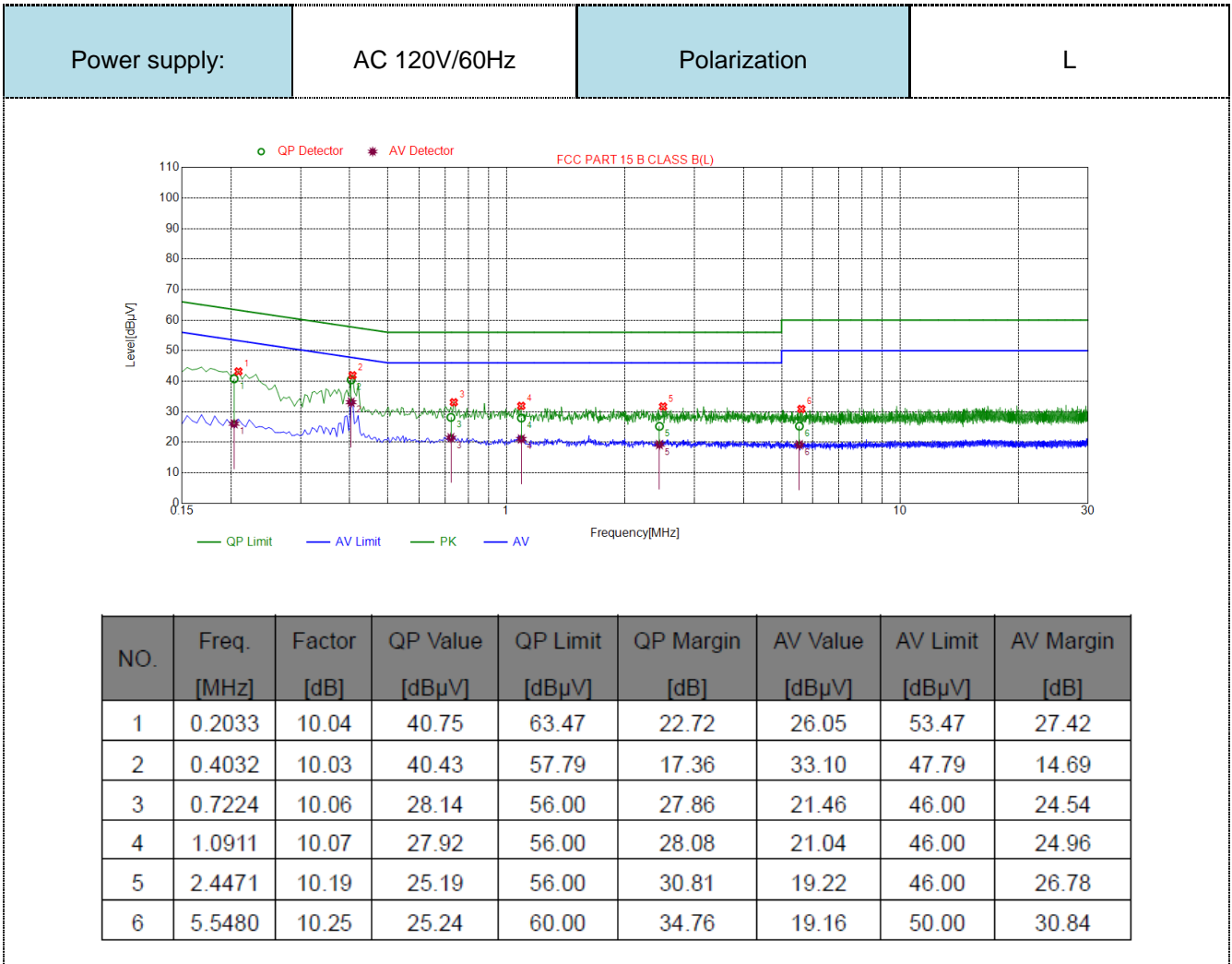
3.4 Test Result

PASS

All the test modes completed for test.

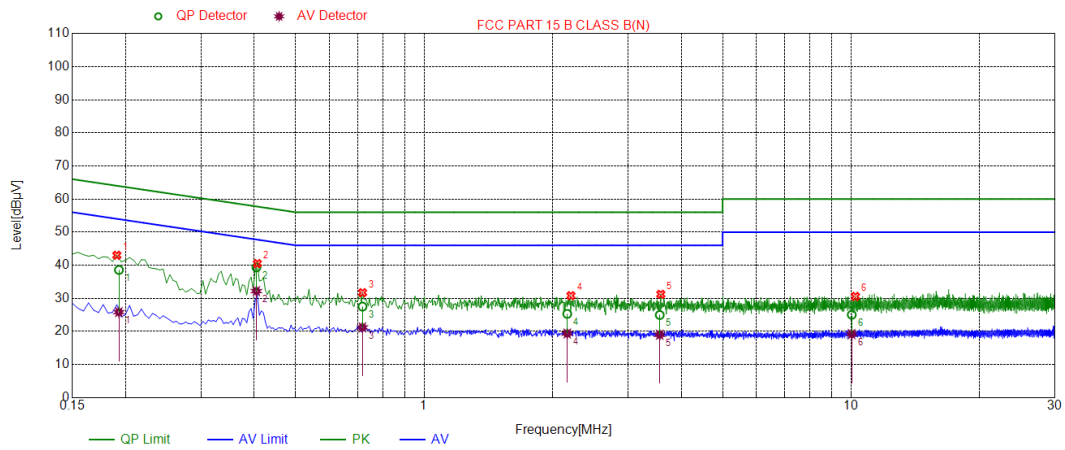


Remark: We measured Conducted Emission at 802.11b/802.11g/802.11n HT20 mode in AC 120V/60Hz,the worst case was recorded .





Power supply:	AC 120V/60Hz	Polarization	N
---------------	--------------	--------------	---



NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]
1	0.1926	10.04	38.56	63.92	25.36	25.81	53.92	28.11
2	0.4044	10.03	39.36	57.76	18.40	32.16	47.76	15.60
3	0.7167	10.05	27.47	56.00	28.53	21.19	46.00	24.81
4	2.1629	10.16	25.28	56.00	30.72	19.33	46.00	26.67
5	3.5622	10.25	24.94	56.00	31.06	18.97	46.00	27.03
6	10.0345	10.06	25.02	60.00	34.98	19.16	50.00	30.84

4 RADIATED EMISSION TEST

4.1 Radiation Limit

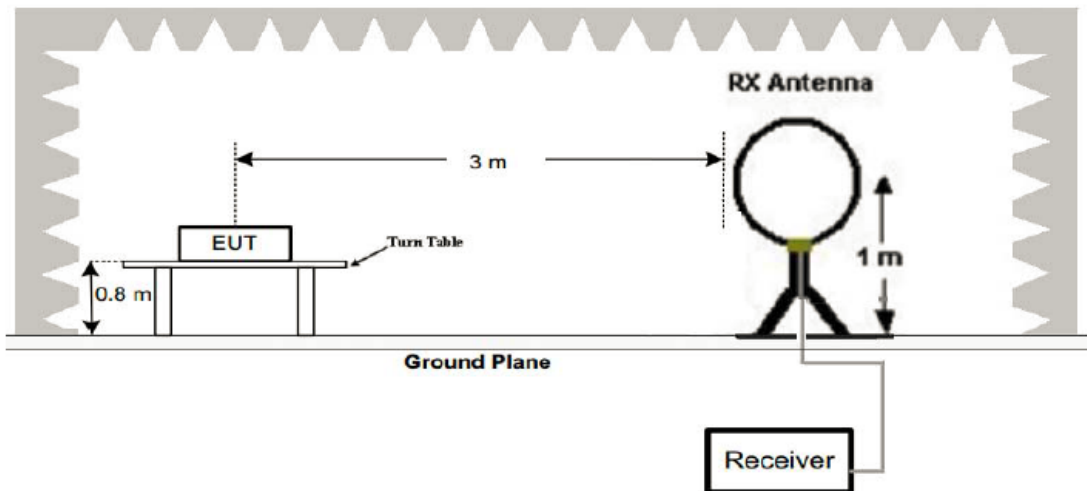
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

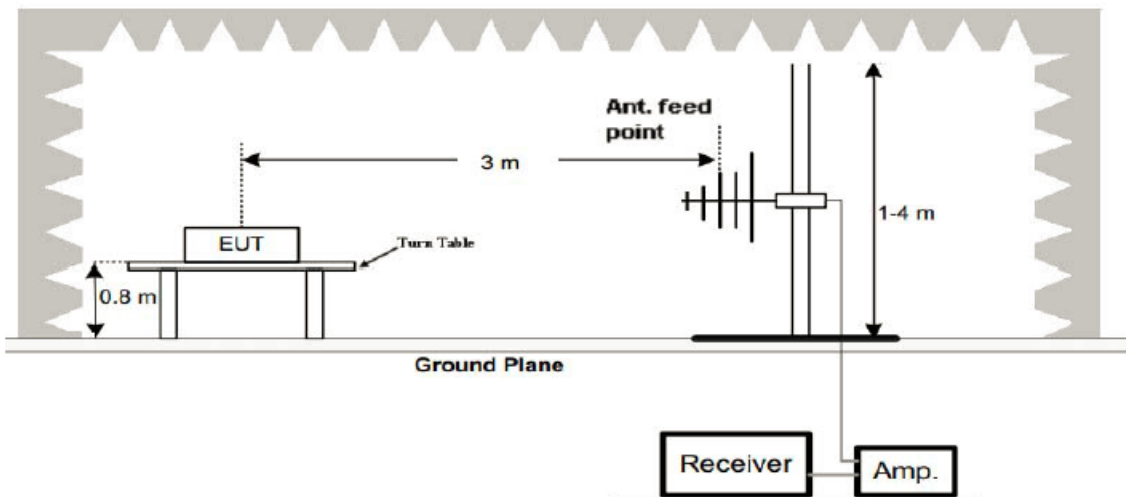
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

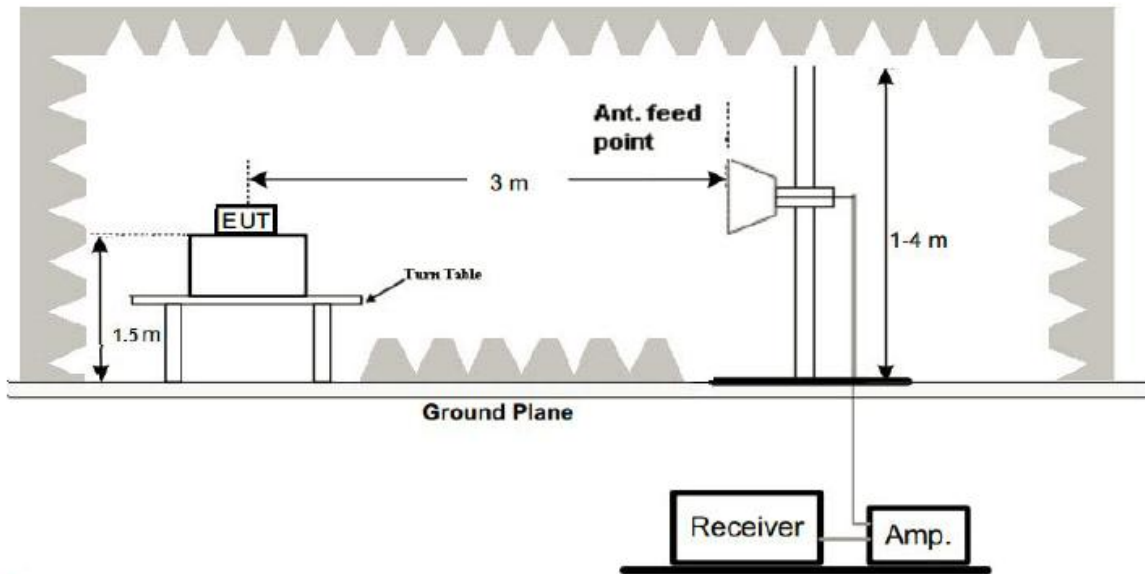
(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



(3) Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn 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 varied from 1m to 4m to find out the highest emissions.
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 test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS

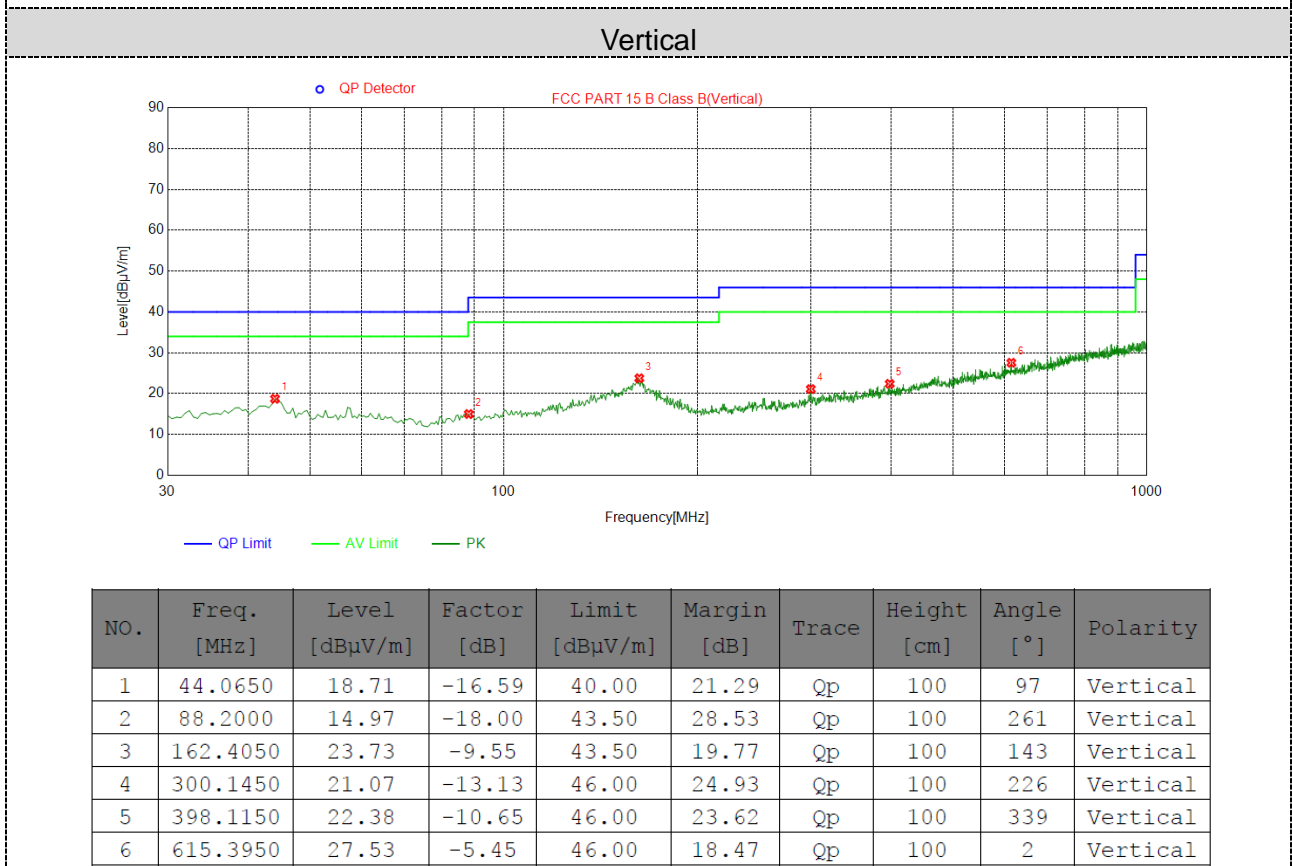
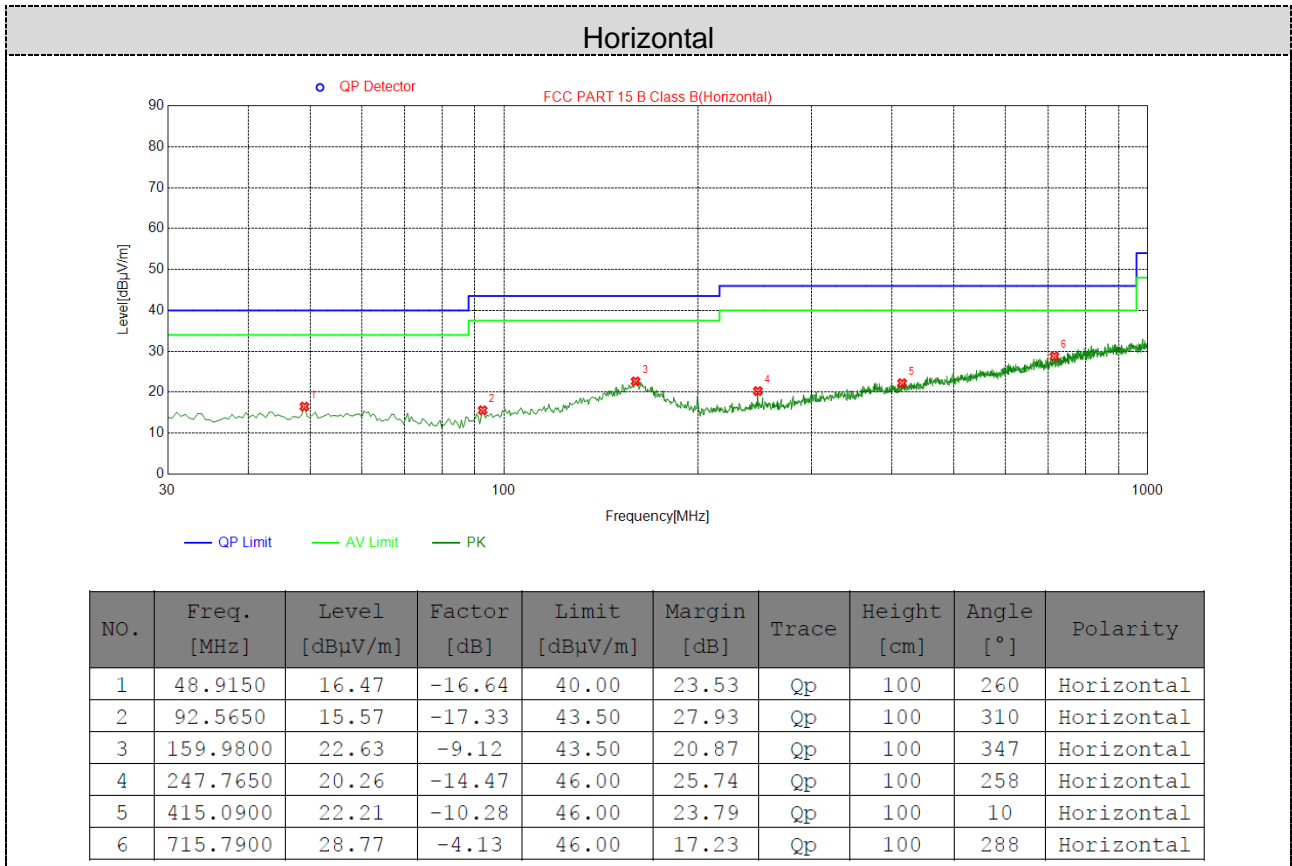
All the test modes completed for test. The worst case of Radiated Emission (802.11b Transmitting Low Channel-2412MHz (worst case)); the test data of this mode was reported.

For 9 KHz-30MHz

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m)@3m	Margin(dB)	Detector	Result
0.27	50.81	98.98	48.17	QP	PASS
0.65	44.59	71.35	26.76	QP	PASS
18.26	45.62	69.54	23.92	QP	PASS
23.42	44.77	69.54	24.77	QP	PASS



For 30MHz-1GHz





Above 1 GHz Test Results:

LOW CH1 (802.11b Mode)/2412
Horizontal:

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4824	63.16	-3.64	59.52	74	-14.48	peak
4824	46.52	-3.64	42.88	54	-11.12	AVG
7236	56.25	-0.95	55.3	74	-18.7	peak
7236	42.37	-0.95	41.42	54	-12.58	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4824	64.26	-3.64	60.62	74	-13.38	peak
4824	46.98	-3.64	43.34	54	-10.66	AVG
7236	57.26	-0.95	56.31	74	-17.69	peak
7236	43.07	-0.95	42.12	54	-11.88	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



MID CH6 (802.11b Mode)/2437
Horizontal:

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
4874	62.97	-3.51	59.46	74	-14.54	peak
4874	45.36	-3.51	41.85	54	-12.15	AVG
7311	57.65	-0.82	56.83	74	-17.17	peak
7311	43.69	-0.82	42.87	54	-11.13	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
4874	64.06	-3.51	60.55	74	-13.45	peak
4874	47.89	-3.51	44.38	54	-9.62	AVG
7311	58.42	-0.82	57.6	74	-16.4	peak
7311	45.26	-0.82	44.44	54	-9.56	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



HIGH CH11 (802.11b Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	64.62	-3.43	61.19	74	-12.81	peak
4924	45.76	-3.43	42.33	54	-11.67	AVG
7386	57.25	-0.75	56.5	74	-17.5	peak
7386	43.15	-0.75	42.4	54	-11.6	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	66.35	-3.43	62.92	74	-11.08	peak
4924	47.21	-3.43	43.78	54	-10.22	AVG
7386	58.65	-0.75	57.9	74	-16.1	peak
7386	44.79	-0.75	44.04	54	-9.96	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.



LOW CH1 (802.11g Mode)/2412
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4824	63.28	-3.64	59.64	74	-14.36	peak
4824	47.12	-3.64	43.48	54	-10.52	AVG
7236	57.27	-0.95	56.32	74	-17.68	peak
7236	42.76	-0.95	41.81	54	-12.19	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4824	62.35	-3.64	58.71	74	-15.29	peak
4824	46.56	-3.64	42.92	54	-11.08	AVG
7236	57.06	-0.95	56.11	74	-17.89	peak
7236	42.01	-0.95	41.06	54	-12.94	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



MID CH6 (802.11g Mode)/2437
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4874	61.25	-3.51	57.74	74	-16.26	peak
4874	47.18	-3.51	43.67	54	-10.33	AVG
7311	57.26	-0.82	56.44	74	-17.56	peak
7311	42.21	-0.82	41.39	54	-12.61	AVG
---	---	---	---	---	---	---
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4874	62.06	-3.51	58.55	74	-15.45	peak
4874	46.19	-3.51	42.68	54	-11.32	AVG
7311	58.65	-0.82	57.83	74	-16.17	peak
7311	42.98	-0.82	42.16	54	-11.84	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



HIGH CH11 (802.11g Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	61.32	-3.43	57.89	74	-16.11	peak
4924	46.25	-3.43	42.82	54	-11.18	AVG
7386	56.39	-0.75	55.64	74	-18.36	peak
7386	42.51	-0.75	41.76	54	-12.24	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	60.15	-3.43	56.72	74	-17.28	peak
4924	46.27	-3.43	42.84	54	-11.16	AVG
7386	56.31	-0.75	55.56	74	-18.44	peak
7386	42.39	-0.75	41.64	54	-12.36	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.



LOW CH1 (802.11n/H20 Mode)/2412
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4824	61.26	-3.64	57.62	74	-16.38	peak
4824	46.16	-3.64	42.52	54	-11.48	AVG
7236	56.01	-0.95	55.06	74	-18.94	peak
7236	42.06	-0.95	41.11	54	-12.89	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4824	61.59	-3.64	57.95	74	-16.05	peak
4824	46.37	-3.64	42.73	54	-11.27	AVG
7236	56.73	-0.95	55.78	74	-18.22	peak
7236	41.62	-0.95	40.67	54	-13.33	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



MID CH6 (802.11n/H20 Mode)/2437
Horizontal:

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4874	61.39	-3.51	57.88	74	-16.12	peak
4874	46.08	-3.51	42.57	54	-11.43	AVG
7311	56.3	-0.82	55.48	74	-18.52	peak
7311	42.01	-0.82	41.19	54	-12.81	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4874	62.03	-3.51	58.52	74	-15.48	peak
4874	46.58	-3.51	43.07	54	-10.93	AVG
7311	57.05	-0.82	56.23	74	-17.77	peak
7311	41.97	-0.82	41.15	54	-12.85	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



HIGH CH11 (802.11n/H20 Mode)/2462
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	61.32	-3.43	57.89	74	-16.11	peak
4924	44.97	-3.43	41.54	54	-12.46	AVG
7386	57.65	-0.75	56.9	74	-17.1	peak
7386	42.01	-0.75	41.26	54	-12.74	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
4924	61.75	-3.43	58.32	74	-15.68	peak
4924	46.43	-3.43	43	54	-11	AVG
7386	57.38	-0.75	56.63	74	-17.37	peak
7386	42.06	-0.75	41.31	54	-12.69	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.



5 BAND EDGE

5.1 Limits

Please refer section 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.

5.3 Test Result

PASS

For Radiated Bandedge Measurement

Operation Mode:
802.11b Mode TX CH Low (2412MHz)
Horizontal

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
2390	65.23	-5.81	59.42	74	-14.58	peak
2390	47.36	-5.81	41.55	54	-12.45	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
2390	66.78	-5.81	60.97	74	-13.03	peak
2390	49.35	-5.81	43.54	54	-10.46	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High (2462MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2483.5	62.17	-5.65	56.52	74	-17.48	peak
2483.5	44.36	-5.65	38.71	54	-15.29	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2483.5	64.16	-5.65	58.51	74	-15.49	peak
2483.5	45.25	-5.65	39.6	54	-14.4	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.



Operation Mode: 802.11g Mode TX CH Low (2412MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2390	62.35	-5.81	56.54	74	-17.46	peak
2390	45.12	-5.81	39.31	54	-14.69	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2390	60.85	-5.81	55.04	74	-18.96	peak
2390	44.01	-5.81	38.2	54	-15.8	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High (2462MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2483.5	58.01	-5.65	52.36	74	-21.64	peak
2483.5	41.76	-5.65	36.11	54	-17.89	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2483.5	59.12	-5.65	53.47	74	-20.53	peak
2483.5	43.25	-5.65	37.6	54	-16.4	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.



Operation Mode: 802.11n/H20 Mode TX CH Low (2412MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	54.12	-5.81	48.31	74	-25.69	peak
2390	42.35	-5.81	36.54	54	-17.46	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	57.05	-5.81	51.24	74	-22.76	peak
2390	43.06	-5.81	37.25	54	-16.75	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High (2462MHz)
Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	57.26	-5.65	51.61	74	-22.39	peak
2483.5	43.79	-5.65	38.14	54	-15.86	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

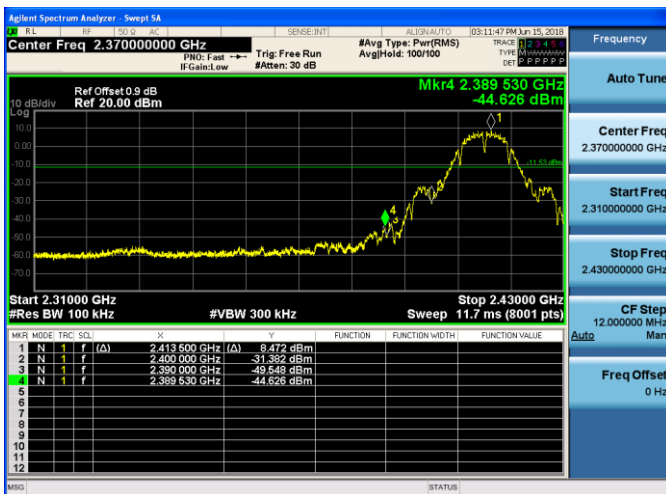
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	59.25	-5.65	53.6	74	-20.4	peak
2483.5	43.51	-5.65	37.86	54	-16.14	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

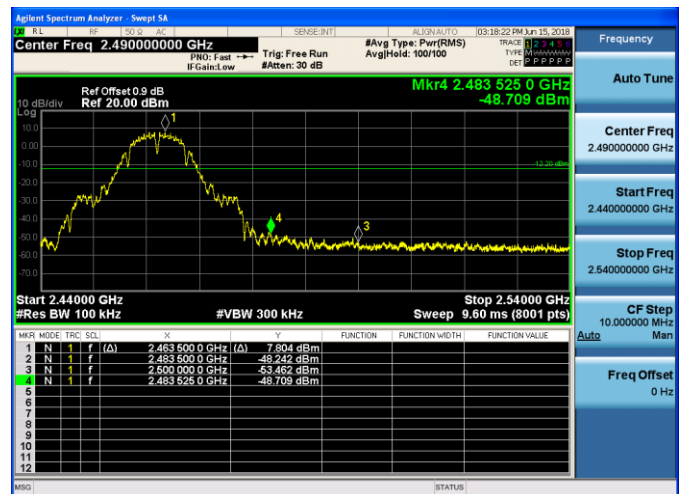
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

For Conducted Bandedge Measurement

802.11b			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-39.85	-20	PASS
2483.50	-56.05	-20	PASS



2412



2462



802.11g			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-33.16	-20	PASS
2483.05	-37.12	-20	PASS

2412	2462

802.11n HT20			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-35.12	-20	PASS
2483.50	-40.04	-20	PASS

2412	2462



6 6dB Bandwidth

6.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

6.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

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

6.3 Test Result

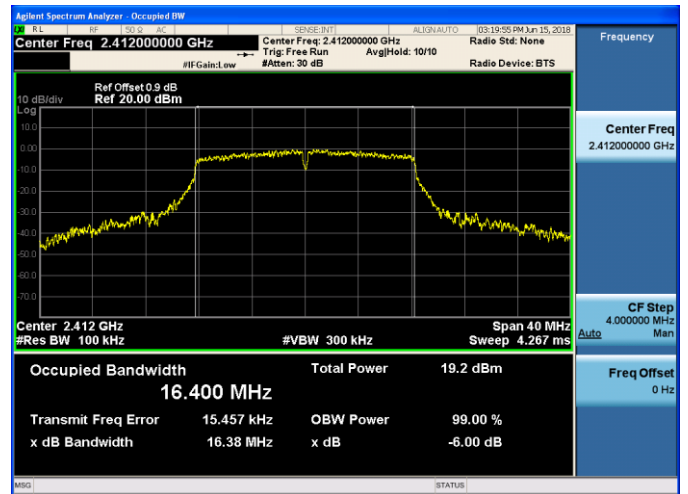
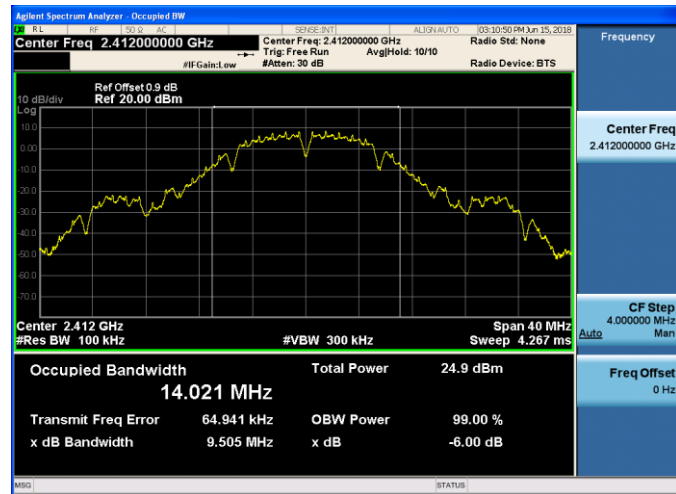
PASS

Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	01	9.505	≥ 500	Pass
	06	9.569		
	11	9.964		
802.11g	01	16.38	≥ 500	Pass
	06	16.39		
	11	16.37		
802.11nHT20	01	17.60	≥ 500	Pass
	06	17.58		
	11	17.60		



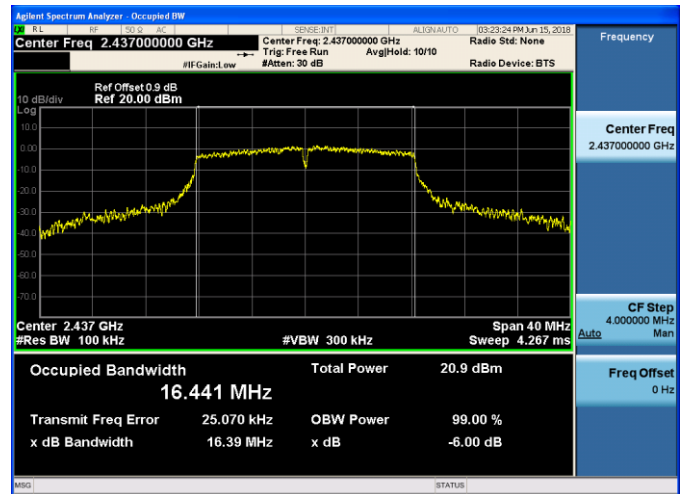
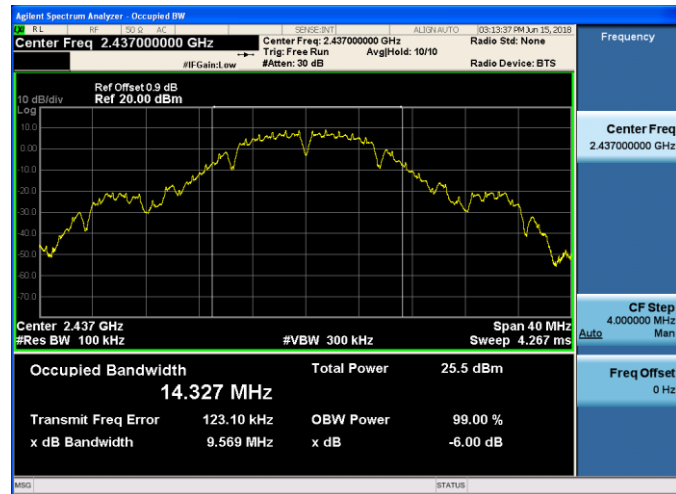
802.11b

802.11g



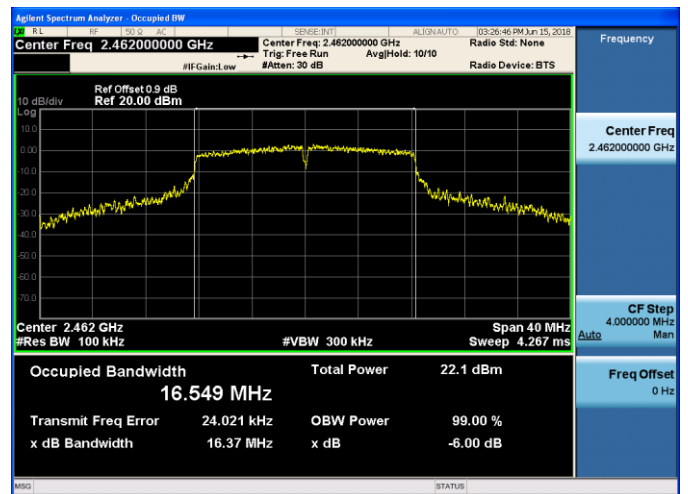
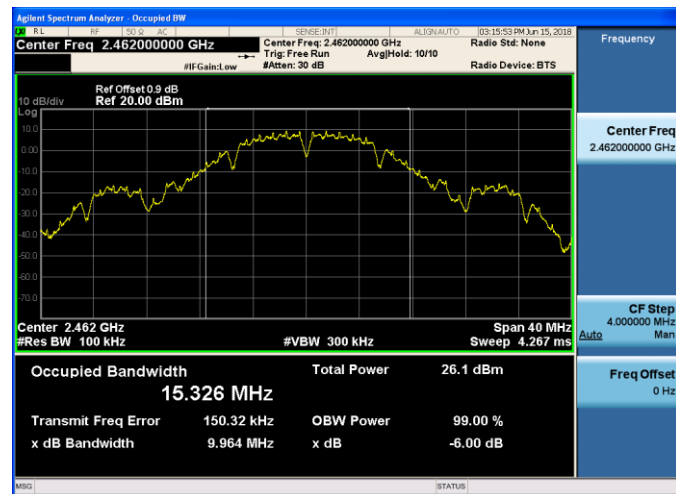
CH01

CH01



CH06

CH06

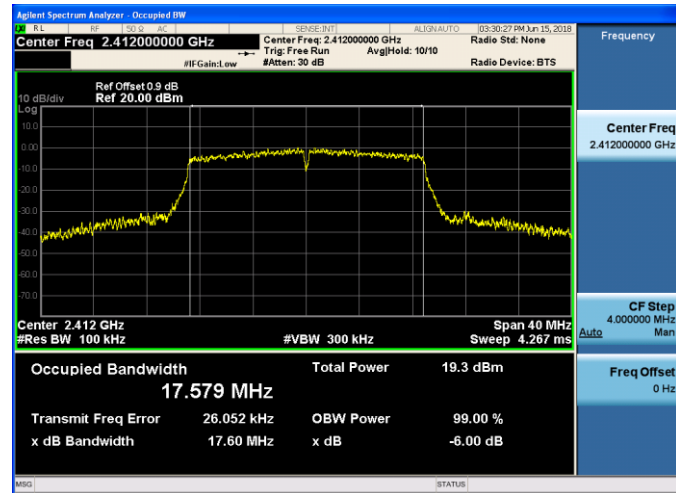


CH11

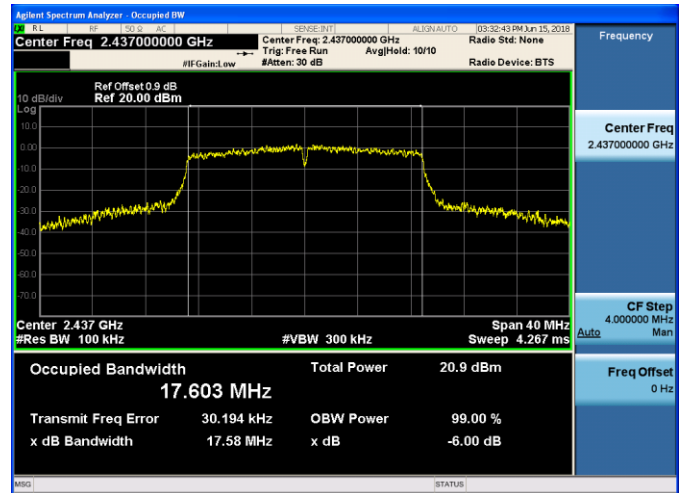
CH11



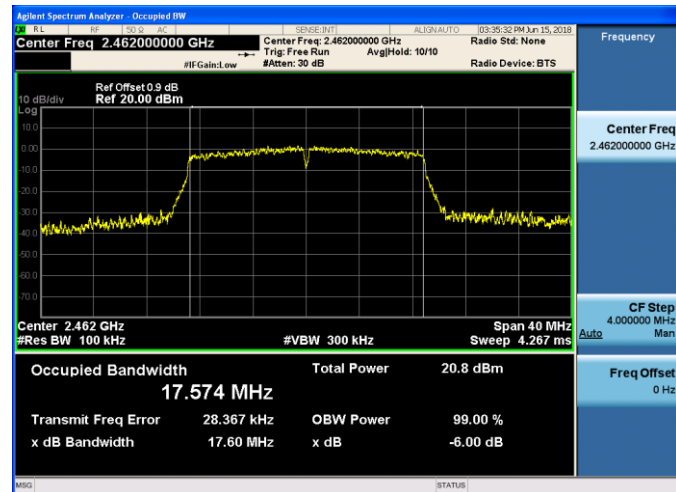
802.11n(HT20)



CH01



CH06



CH11



7 POWER SPECTRAL DENSITY TEST

7.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

7.2 Test Procedure

According to KDB 558074 D01 Method PKPSD (peak PSD) This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \text{ RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

7.3 Test Result

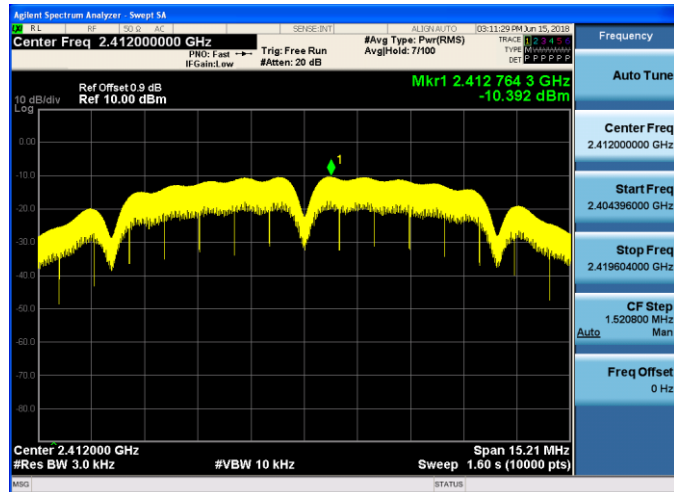
PASS

All the test modes completed for test.

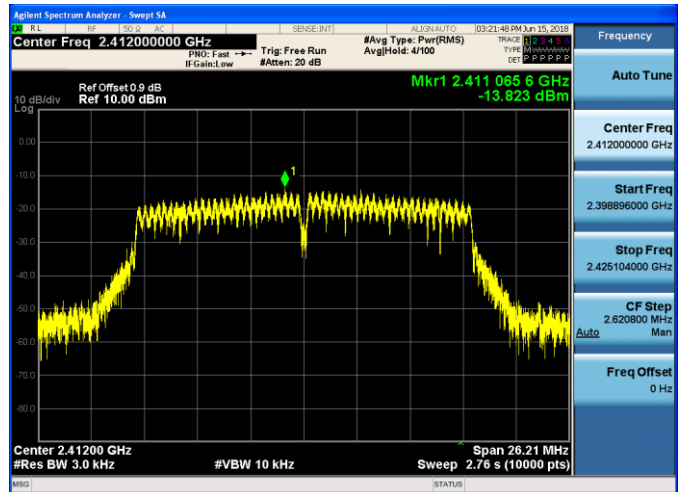
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-10.392	8.00	Pass
	06	-10.210		
	11	-11.026		
802.11g	01	-13.823	8.00	Pass
	06	-12.765		
	11	-12.445		
802.11n(HT20)	01	-13.578	8.00	Pass
	06	-14.063		
	11	-14.116		



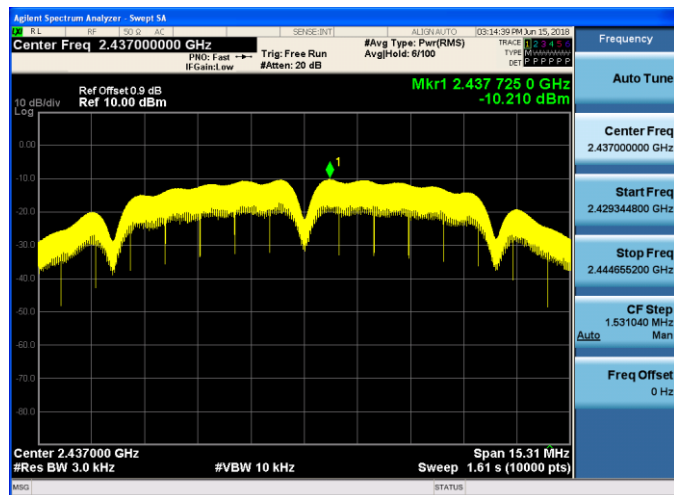
802.11b



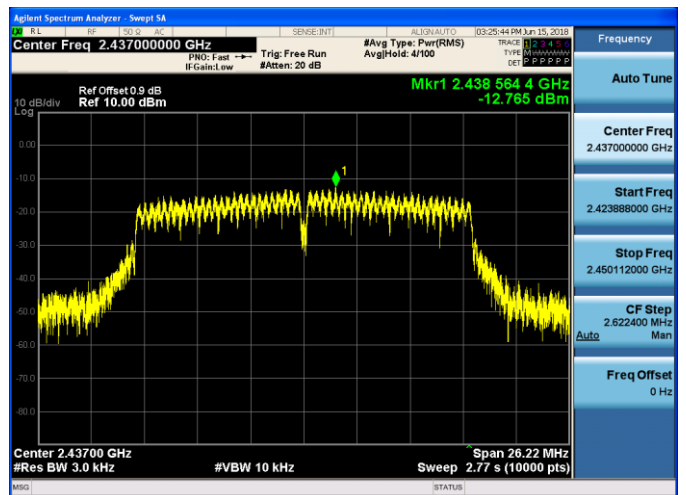
802.11g



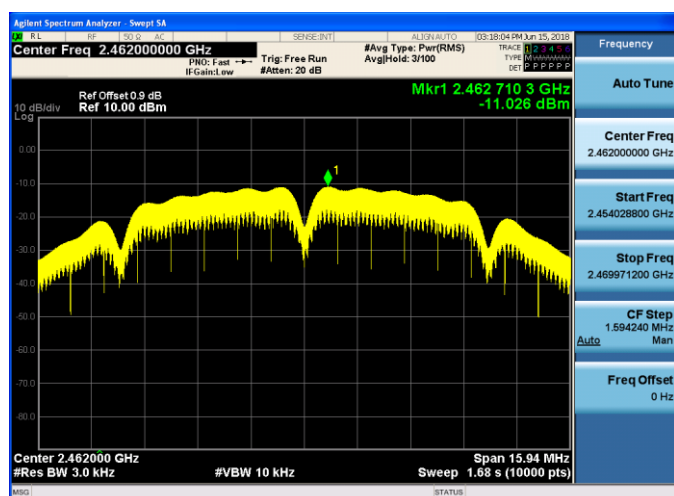
CH01



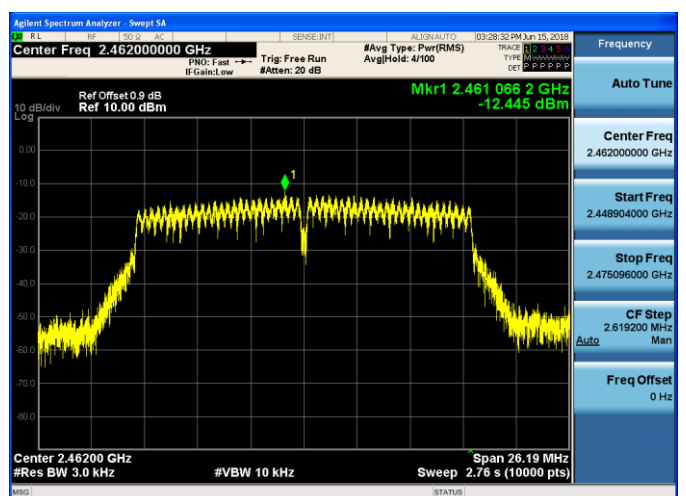
CH01



CH06



CH06

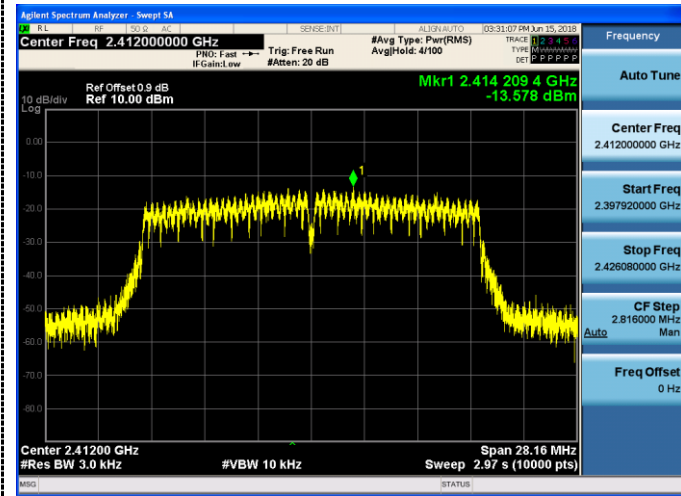


CH11

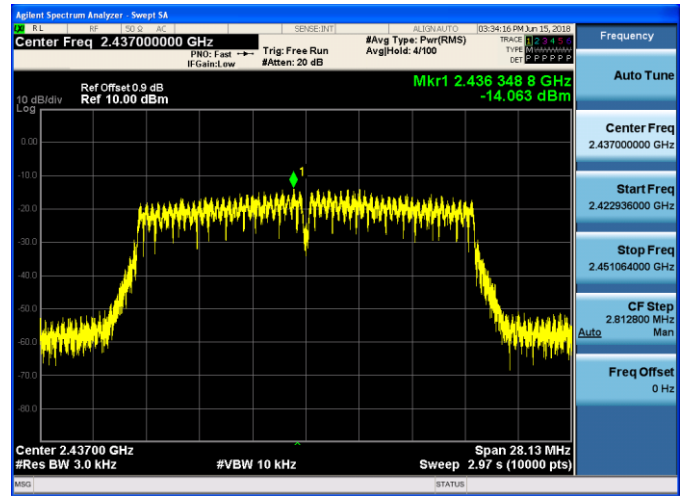
CH11



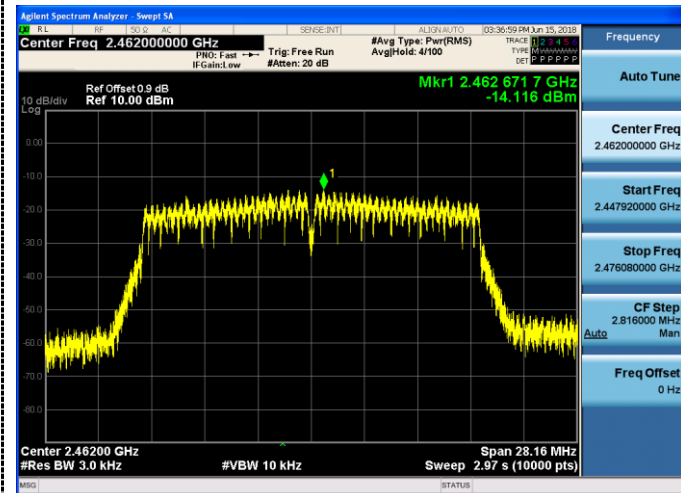
802.11n(HT20)



CH01



CH03



CH11



8 PEAK OUTPUT POWER TEST

8.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

8.2 Test Procedure

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2. and Average conducted output power, 9.2.3.1.

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.

The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple derector or equivalent. 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.

8.3 Test Result

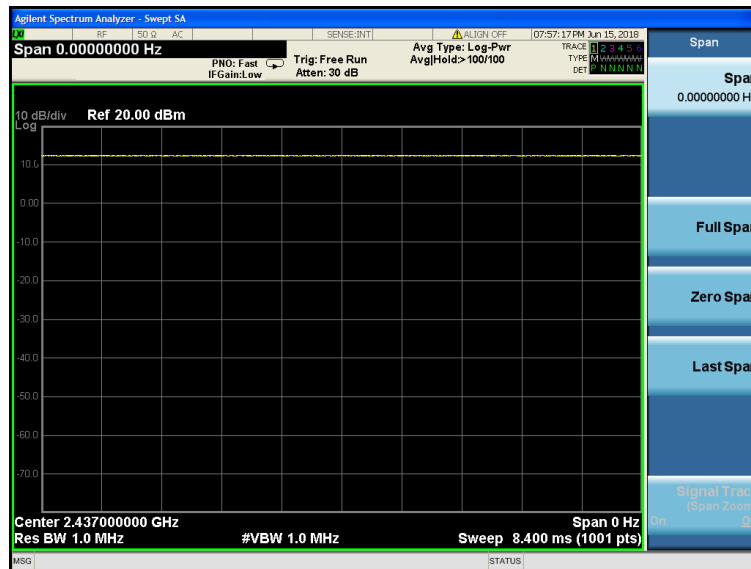
PASS



Type	Channel	Output power PK (dBm)	Output power AV (dBm)	Limit (dBm)	Result
802.11b	01	22.03	19.12	30.00	Pass
	06	22.15	19.25		
	11	21.35	18.49		
802.11g	01	21.09	17.12	30.00	Pass
	06	22.69	18.76		
	11	22.47	18.58		
802.11n(HT20)	01	21.26	16.89	30.00	Pass
	06	21.37	16.97		
	11	21.26	16.81		

Note: 1.The test results including the cable lose.

Duty cycle used in all test items: 100%





9 OUT OF BAND EMISSIONS TEST

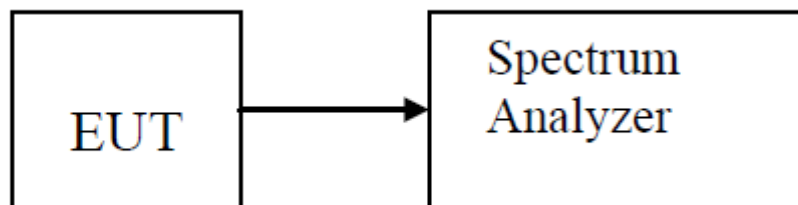
9.1 Test Limit

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

9.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 30MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and mwasure frequency range from 30MHz to 25GHz.

9.3 Test Setup



7.4 Test Result

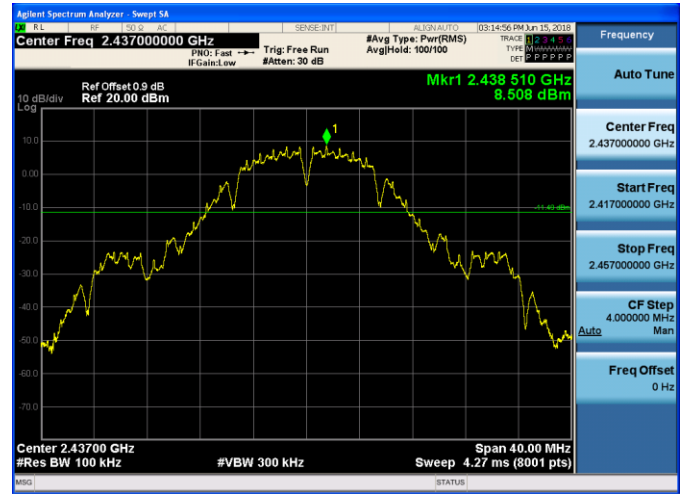
PASS

All the test modes completed for test.

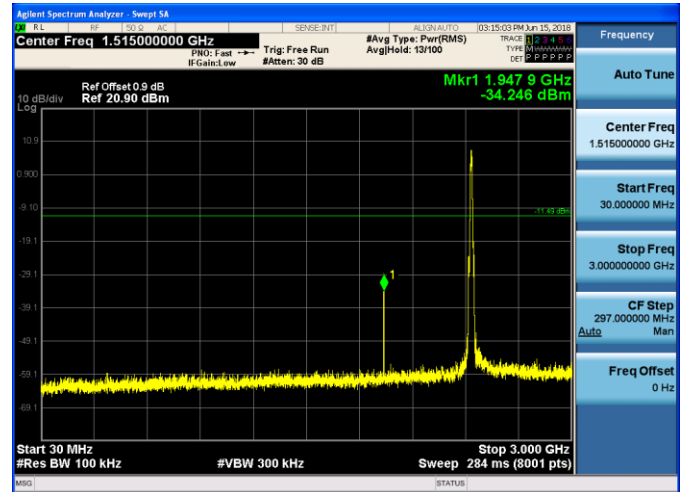
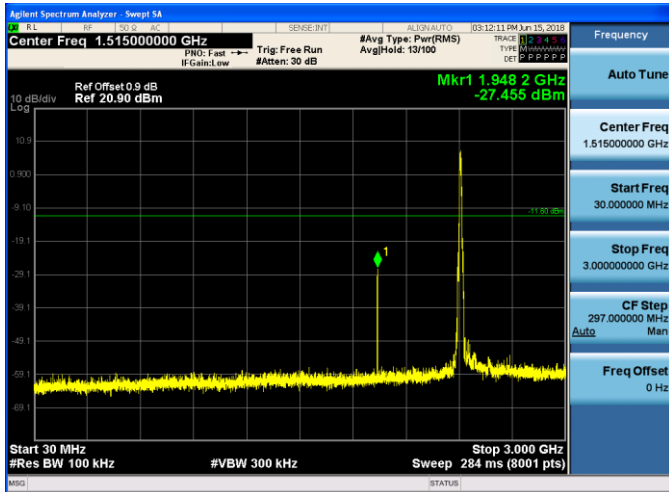


802.11b CH01

802.11b CH06

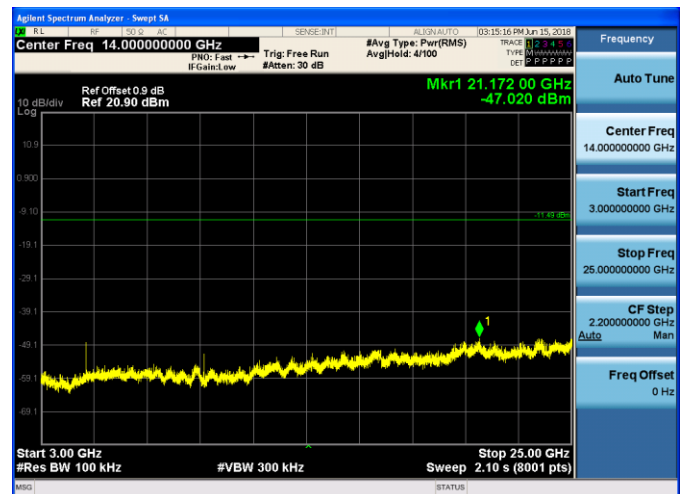
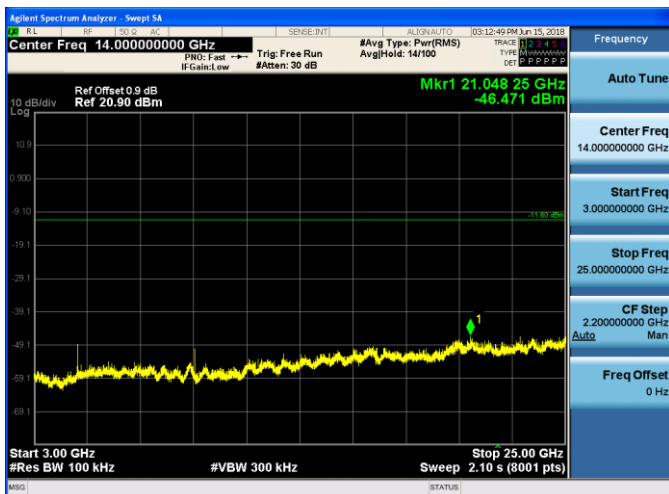


Reference



30MHz - 3GHz

30MHz - 3GHz



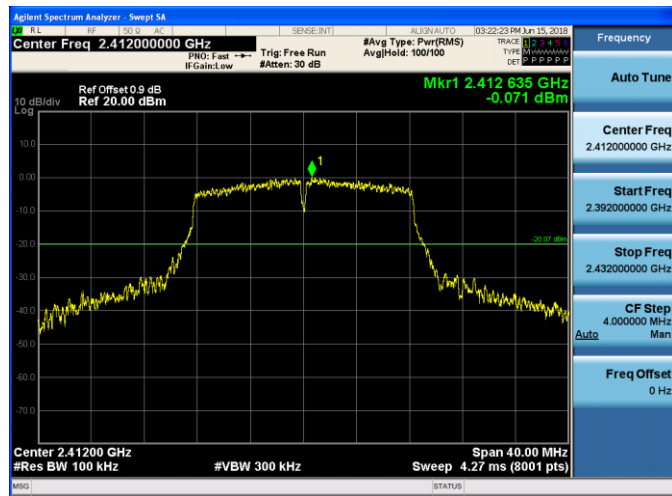
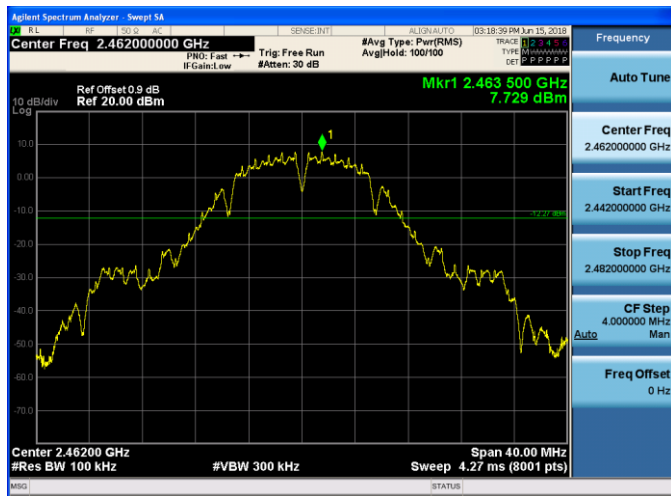
3GHz - 25GHz

3GHz - 25GHz



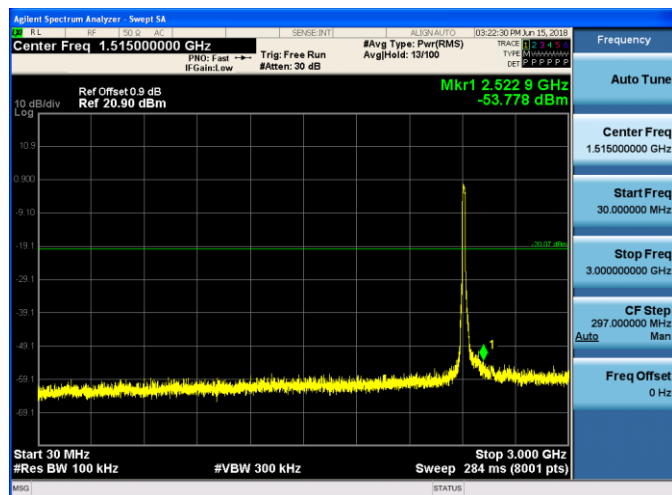
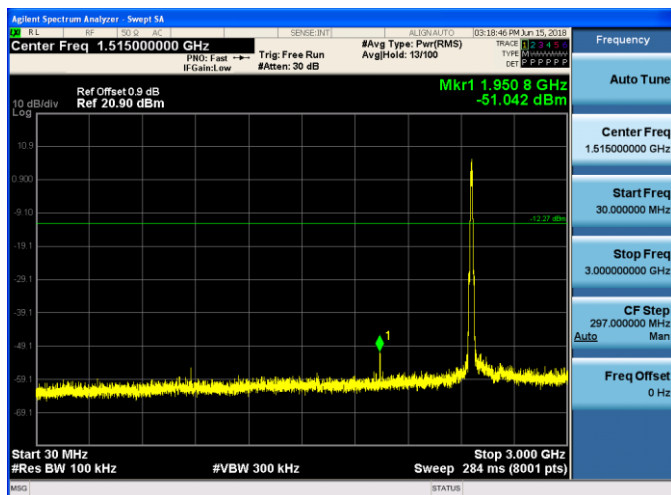
802.11b CH11

802.11g CH01



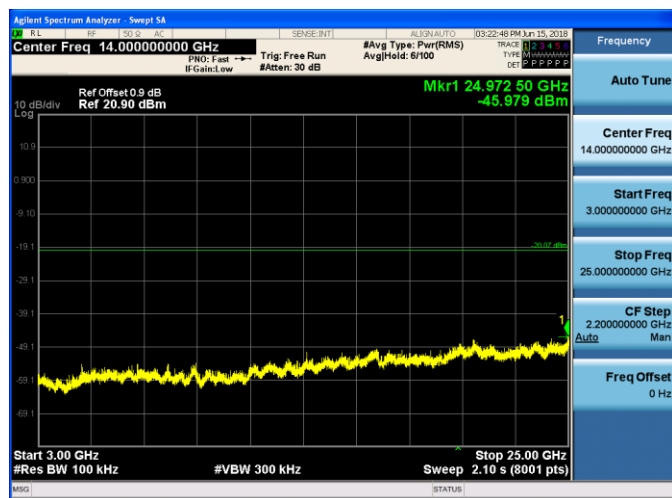
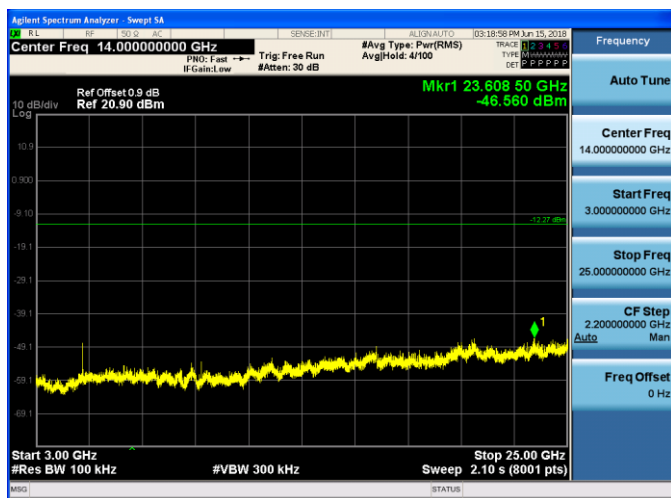
Reference

Reference



30MHz - 3GHz

30MHz - 3GHz

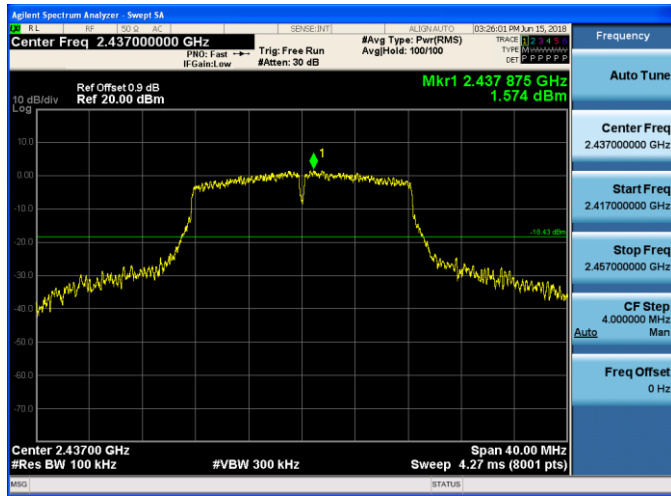


3GHz - 25GHz

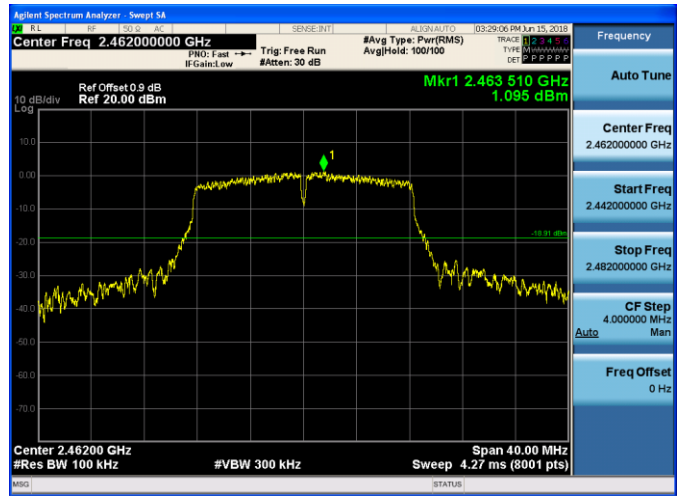
3GHz - 25GHz



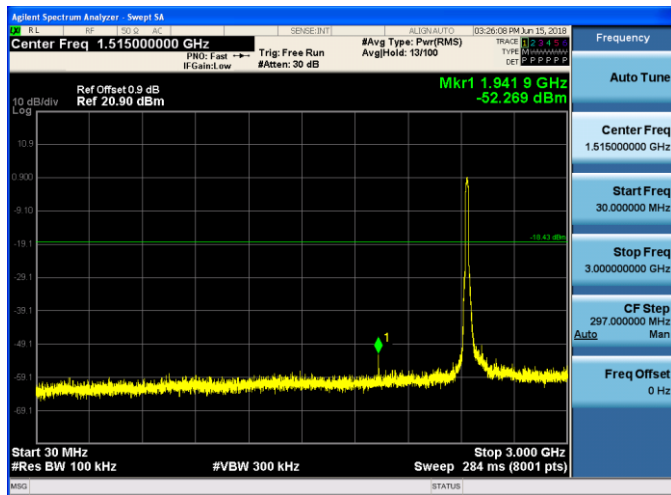
802.11g CH06



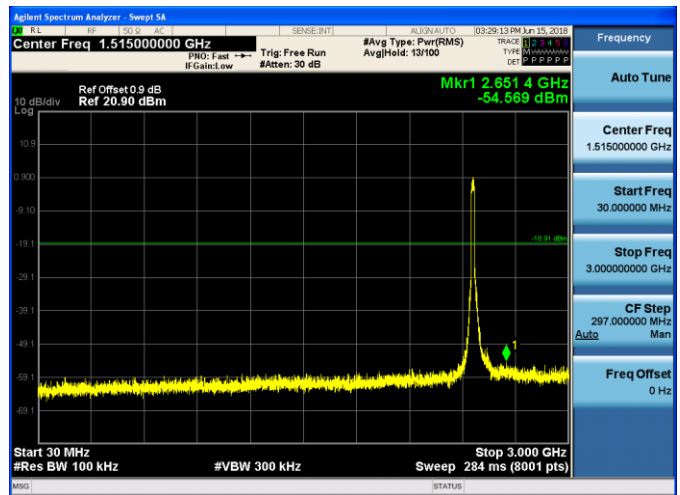
802.11g CH11



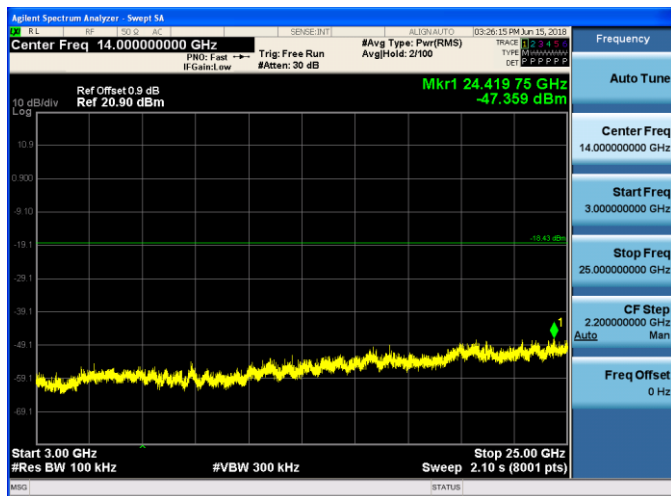
Reference



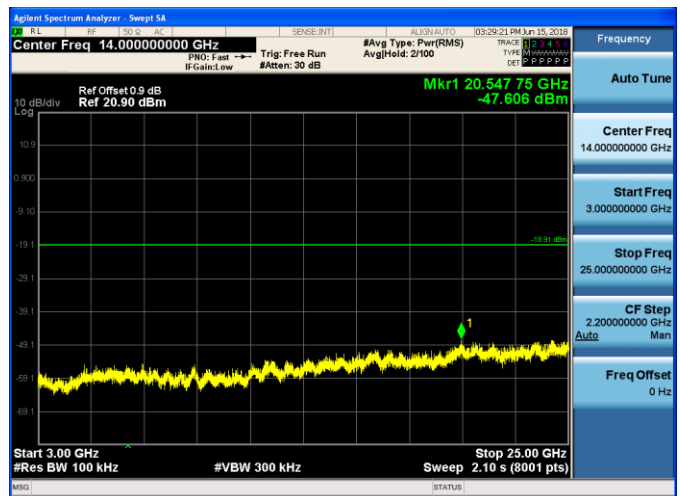
Reference



30MHz - 3GHz



30MHz - 3GHz



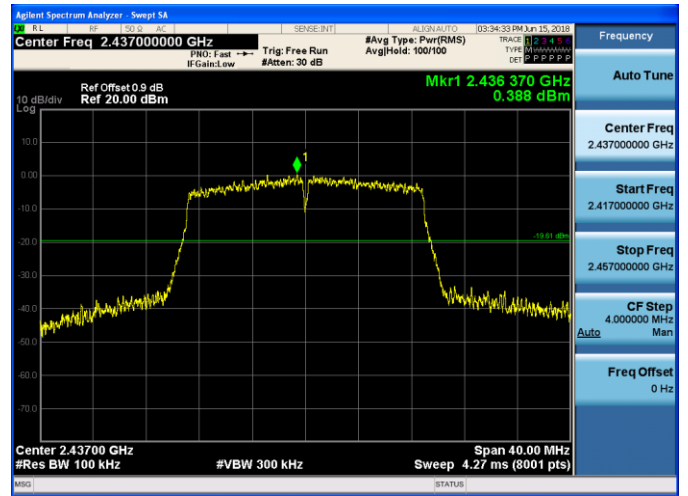
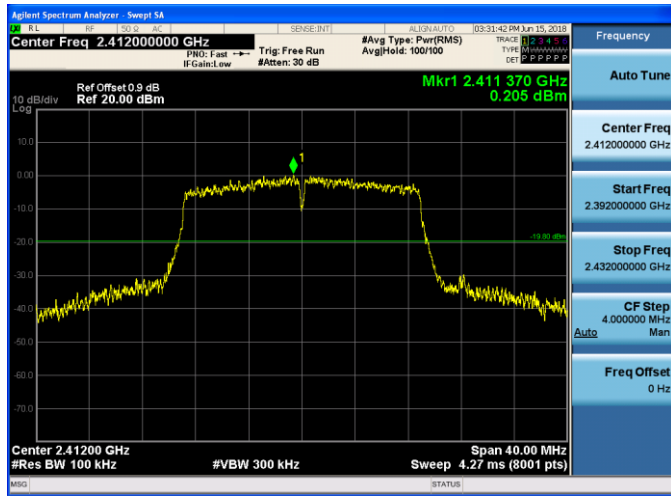
3GHz - 25GHz

3GHz - 25GHz

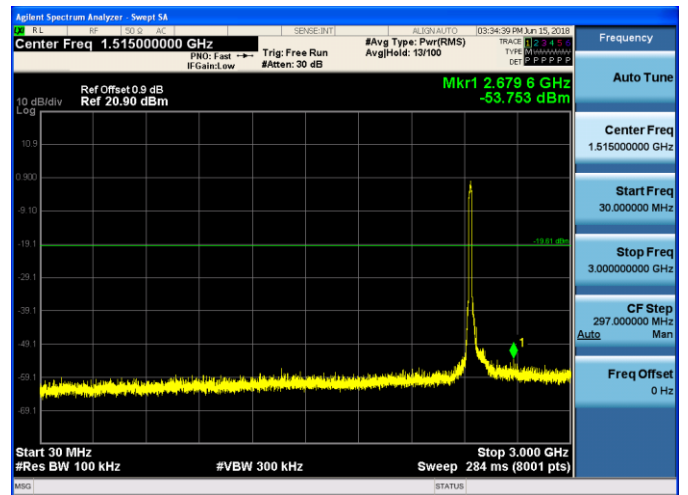
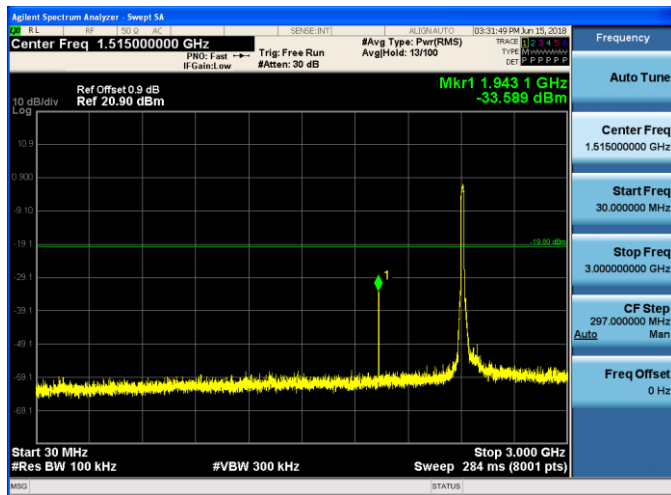


802.11n(HT20) CH01

802.11n(HT20) CH06

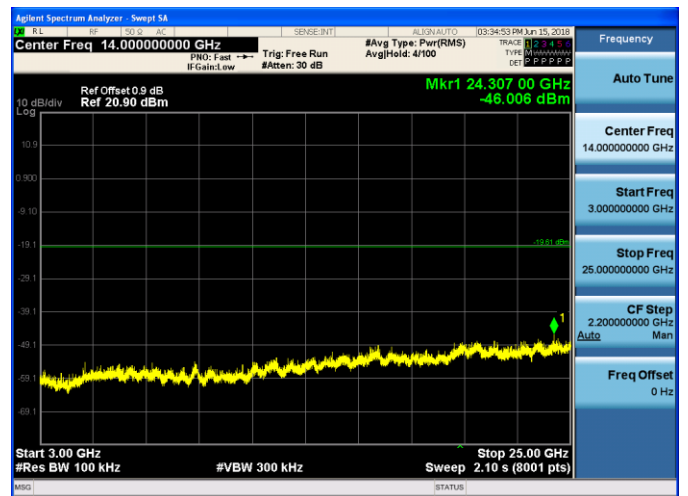
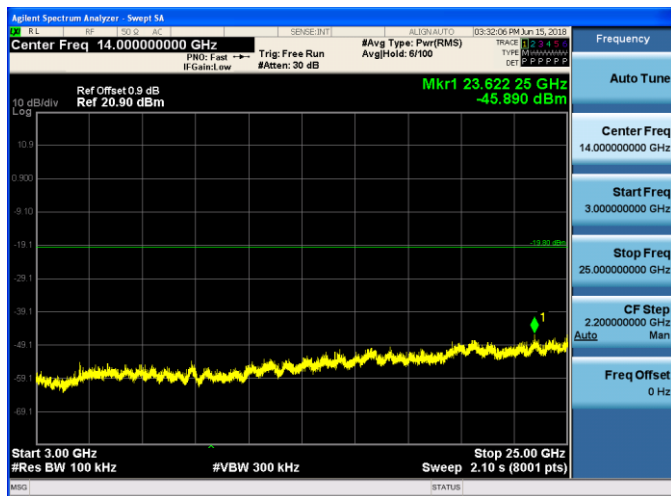


Reference



30MHz - 3GHz

30MHz - 3GHz

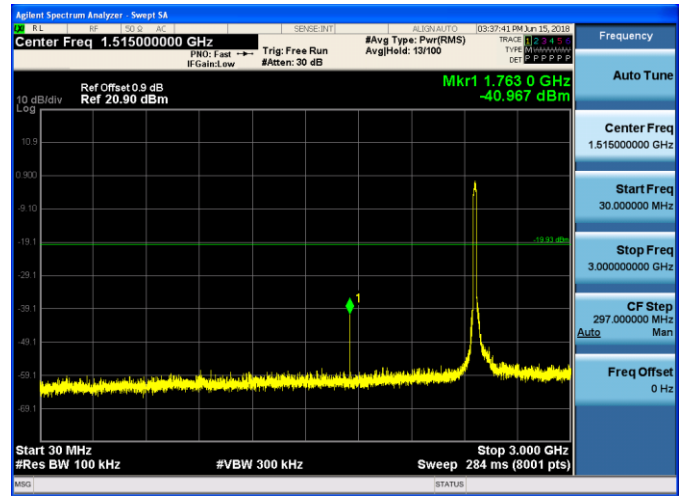
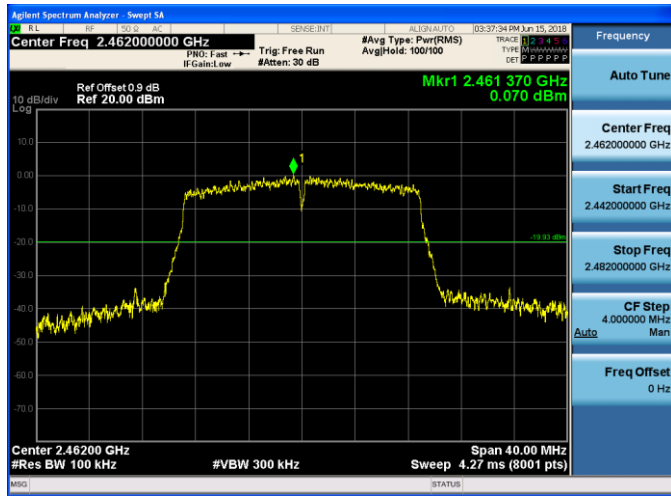


3GHz - 25GHz

3GHz - 25GHz

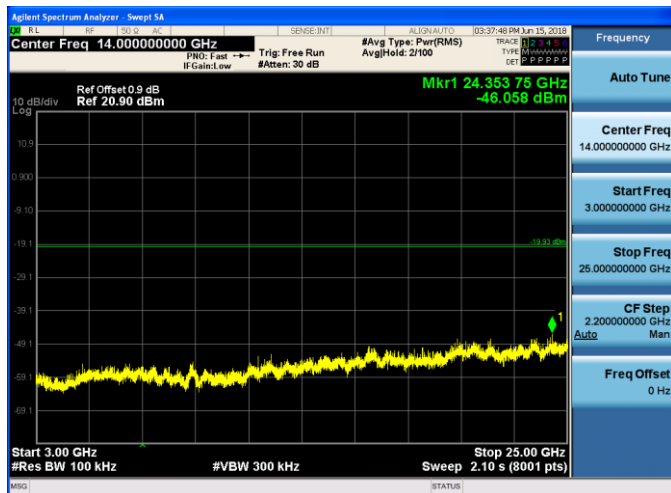


802.11n(HT20) CH11



Reference

30MHz - 3GHz



3GHz - 25GHz

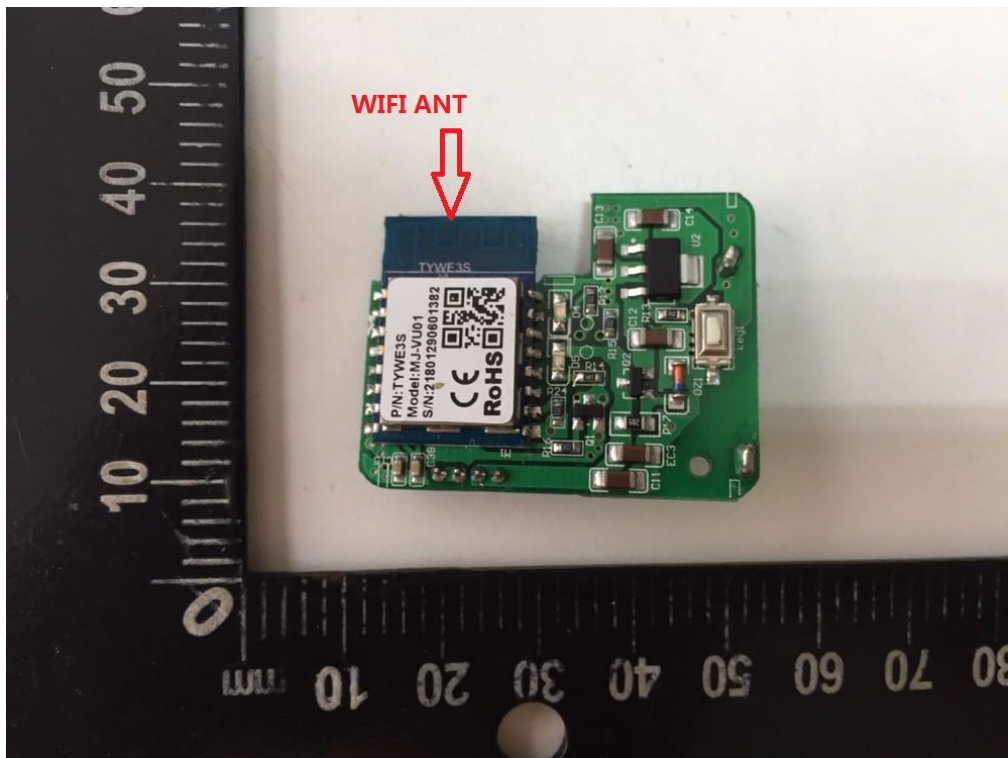
10 ANTENNA REQUIREMENT

Standard Applicable

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, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

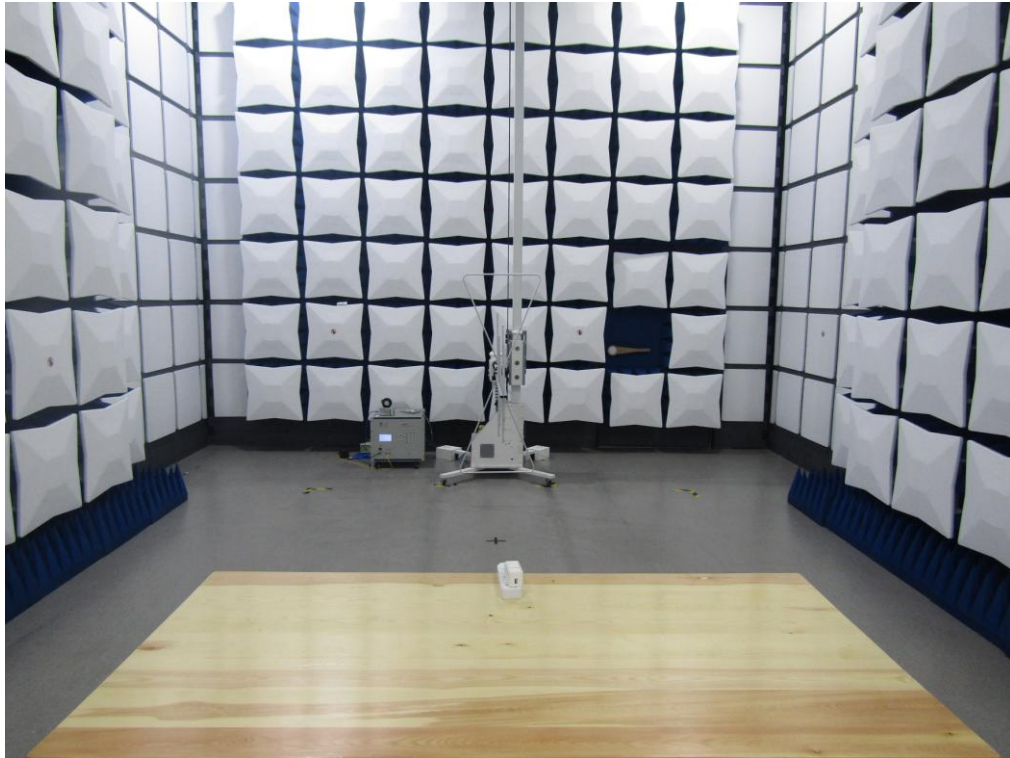
Antenna Information

The antenna is layout on PCB board, the directional gains of antenna used for transmitting is 3.00dBi.



11 PHOTOGRAPH OF TEST

11.1 Radiated Emission



11.2 Conducted Emission

