



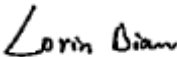

# FCC PART 15.247 TEST REPORT

For

## Shenzhen AEE Aviation Technology Co.,Ltd

AEE Hi-Tech Park, Tangtou Crossroads, Shiyan Town, Baoan District Shenzhen, P.R.C.

**FCC ID: 2AGZG-AEESLATE**

<b>Report Type:</b> Original Report	<b>Product Name:</b> Hand Gimbal
<b>Test Engineer:</b> <u>Lorin Bian</u>	
<b>Report Number:</b> <u>RDG160921801</u>	
<b>Report Date:</b> <u>2016-11-05</u>	
<b>Reviewed By:</b> <u>Henry Ding</u> EMC Leader	
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The **Shenzhen AEE Aviation Technology Co.,Ltd**'s product, model number: **I11 (FCC ID: 2AGZG-AEESLATE)** (the "EUT") in this report was a **Hand Gimbal**, which was measured approximately: 9.7 cm (L) x 7.1 cm (W) x 6.85 cm (H), the EUT was powered by Hand Shank system.

*Note: The series product, model I11, I12 and AEE Slate Elite are electrically identical, the difference between them is the model name, we selected I11 for fully testing, the details was explained in the attached declaration letter.*

*\*All measurement and test data in this report was gathered from final production sample, serial number: 160921801 (assigned by the BAACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-09-23, and EUT conformed to test requirement.*

### Objective

This report is prepared on behalf of **Shenzhen AEE Aviation Technology Co.,Ltd** in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's rules

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205,15.207,15.209 and 15.247 rules.

### Related Submittal(s)/Grant(s)

N/A.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The uncertainty of any RF tests which use conducted method measurement is  $\pm 3.17$  dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz:  $\pm 4.7$  dB;  
200M~1GHz:  $\pm 6.0$  dB;  
1G~6GHz:  $\pm 5.13$ dB;  
6G~25GHz:  $\pm 5.47$ dB;

And the uncertainty will not be taken into consideration for all test data recorded in the report.

## **Test Facility**

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer. For 2.4GHz band, 11 channels are provided:

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

For 802.11b, 802.11g, and 802.11n ht20 modes were tested with channel 1, 6 and 11.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

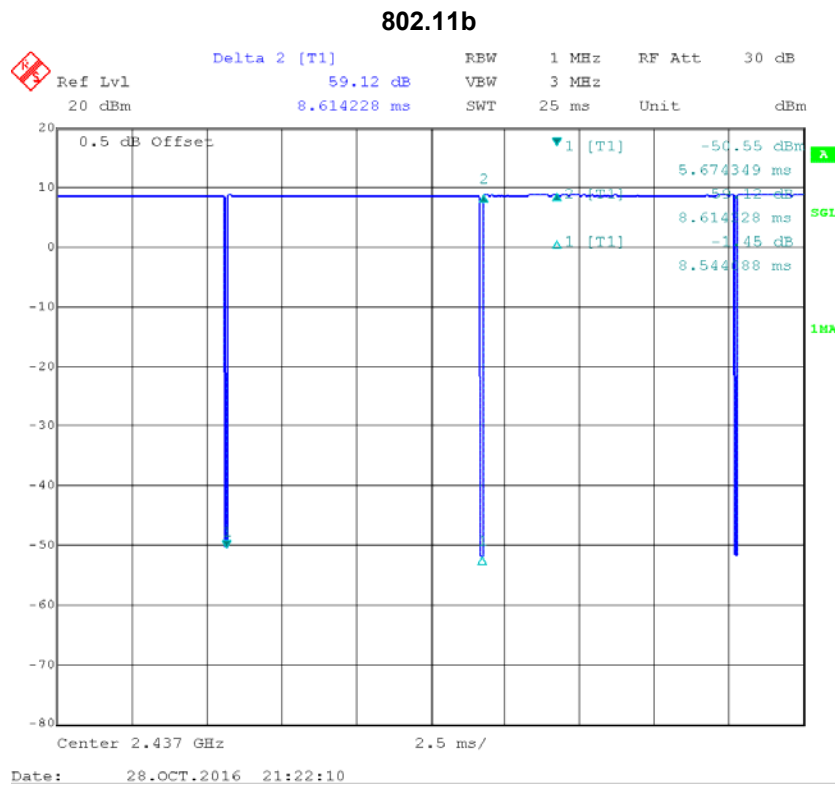
The software "F1 Teraterm-4.71" was used for testing, which was provided by manufacturer. The worst condition was setting by the software as following table:

Test Mode	Test Software Version	F1 Teraterm-4.71		
		2412MHz	2437MHz	2462MHz
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Chain 0	1	1	1
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Chain 0	1	1	1
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Chain 0	1	1	1

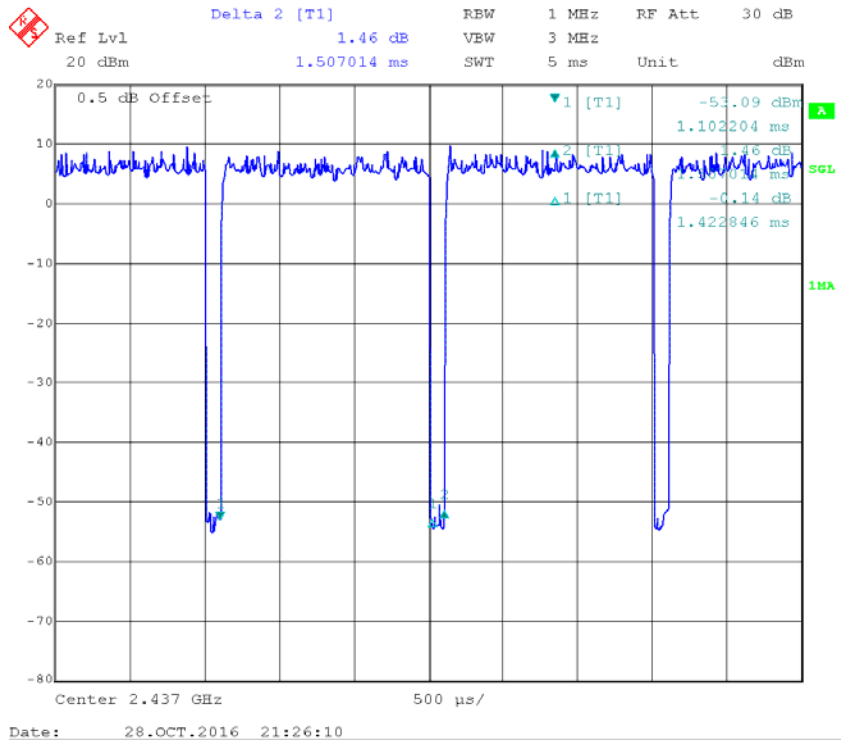
The duty cycle as below:

Test Mode	T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle (%)
802.11b	8.54	8.61	99%
802.11g	1.42	1.51	94%
802.11n ht20	1.33	1.42	94%

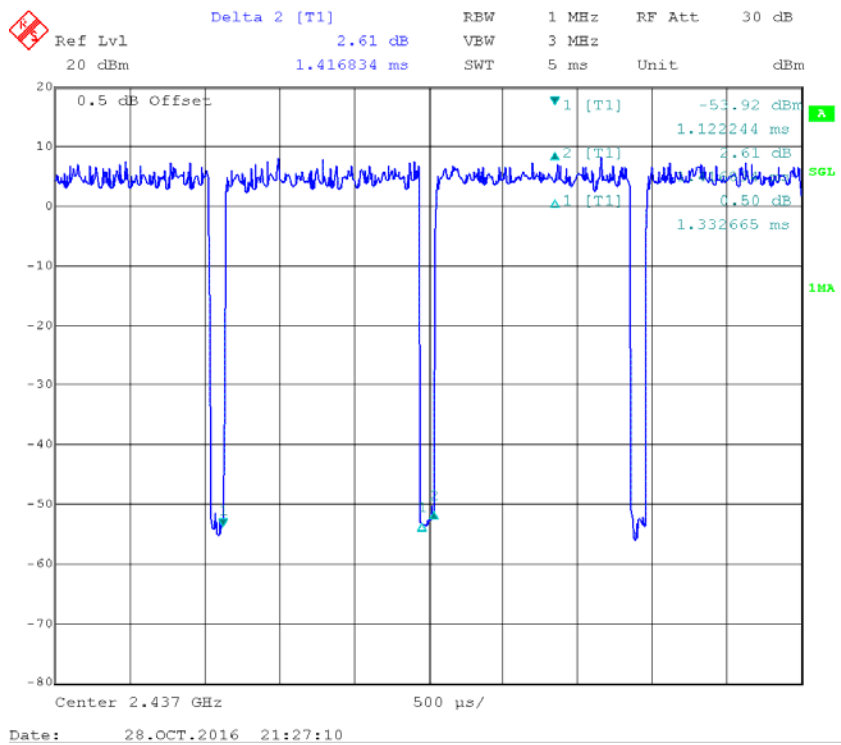
The minimum transmission duration(T) is 8.54ms for 802.11b. 1.42ms for 802.11g, 1.33ms for 802.11n ht20.



802.11g



802.11n ht20





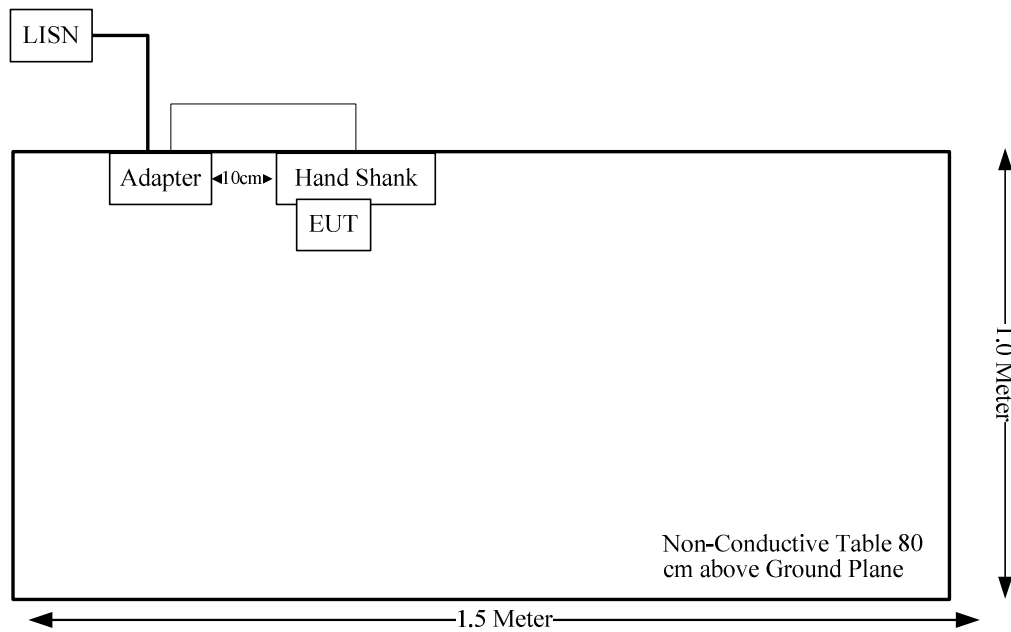
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
AEE	Hand Shank	Z09	/
AEE	Adapter	Z09	/

### External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	No	No	1.18	Adater	Hand Shank

### Block Diagram of Test Setup



## **SUMMARY OF TEST RESULTS**

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<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
FCC §15.247 (i) & §1.1310 & §2.1093	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum conducted output power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

## **FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE**

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### **Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

### **Measurement Result**

The max. power including tune-up tolerance is 13.5dBm (22.39mW).

$[(\text{max. power of channel, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$   
 $= 22.39/5 \cdot (\sqrt{2.462}) = 7.0 \leq 7.5$

Note: the EUT is a hand hold device

**So the SAR evaluation is not necessary.**

## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

### **Antenna Connector Construction**

The EUT has an internal antenna, which were permanently attached and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC§15.207

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 1, then:

–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

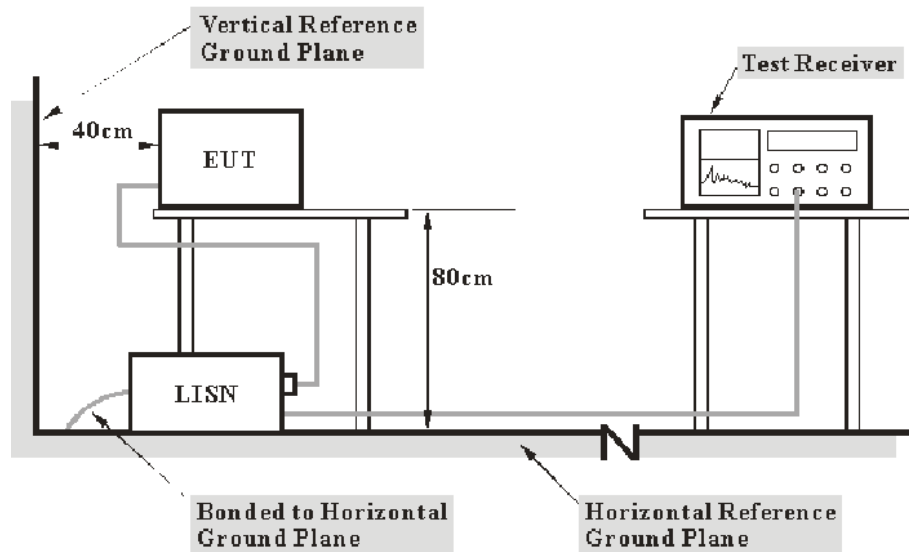
–compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is  $\pm 3.17$  dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{cispr}$

Measurement	$U_{cispr}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

## EUT Setup



- Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120 V/60 Hz power source.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

## Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

$V_C$  (cord. Reading): corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN

$C_f$ : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2015-12-02	2016-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2015-10-31	2016-10-30
N/A	Conducted Cable	NO.5	N/A	2015-11-10	2016-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

\* **Statement of Traceability:** BA CL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

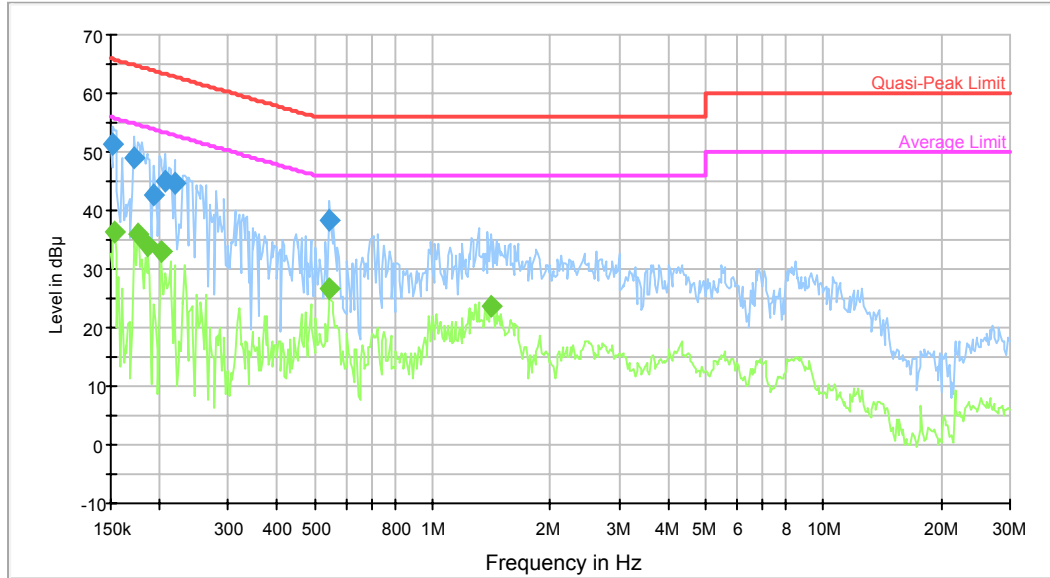
#### Environmental Conditions

<b>Temperature:</b>	29 °C
<b>Relative Humidity:</b>	57 %
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Lorin Bian on 2016-10-20.*

Test Mode: Transmitting

AC120 V, 60 Hz, Line:

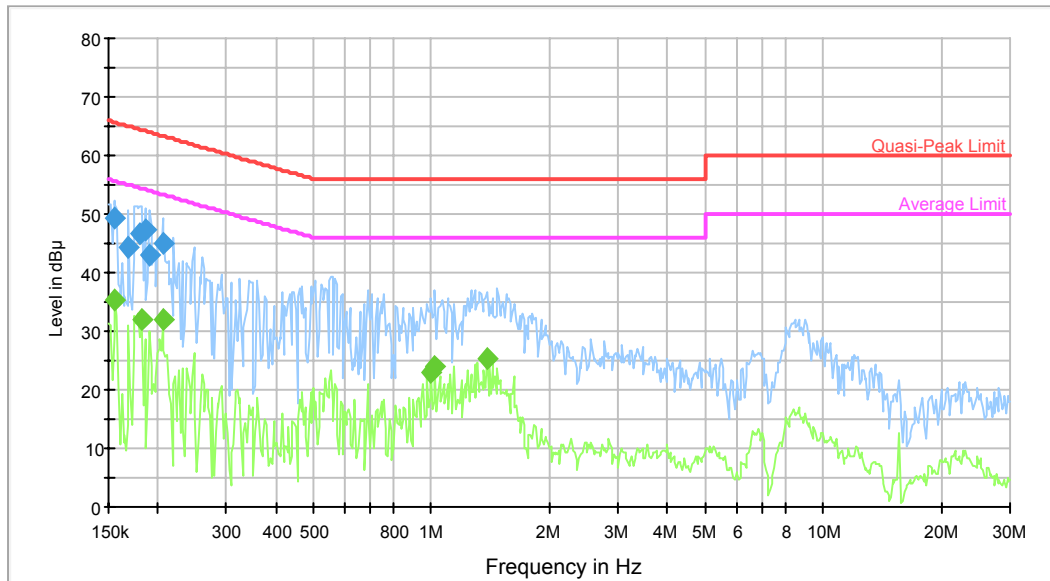


Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.152410	51.5	9.000	L1	19.74	14.4	65.9	Compliance
0.171759	49.1	9.000	L1	19.7	15.8	64.9	Compliance
0.193566	42.8	9.000	L1	19.68	21.1	63.9	Compliance
0.207957	45.1	9.000	L1	19.67	18.2	63.3	Compliance
0.218141	44.8	9.000	L1	19.67	18.1	62.9	Compliance
0.545378	38.5	9.000	L1	19.74	17.5	56.0	Compliance

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.153629	36.4	9.000	L1	19.73	19.4	55.8	Compliance
0.175915	36.0	9.000	L1	19.69	18.7	54.7	Compliance
0.187494	33.9	9.000	L1	19.68	20.2	54.1	Compliance
0.201433	32.9	9.000	L1	19.67	20.7	53.6	Compliance
0.545378	26.6	9.000	L1	19.74	19.4	46.0	Compliance
1.407671	23.6	9.000	L1	19.7	22.4	46.0	Compliance



**AC120 V, 60 Hz, Neutral:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154858	49.4	9.000	N	19.71	16.3	65.7	Compliance
0.169044	44.4	9.000	N	19.68	20.6	65.0	Compliance
0.180171	46.6	9.000	N	19.65	17.9	64.5	Compliance
0.186006	47.2	9.000	N	19.63	17.0	64.2	Compliance
0.190505	43.0	9.000	N	19.62	21.0	64.0	Compliance
0.206306	45.0	9.000	N	19.59	18.4	63.4	Compliance

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.156097	35.2	9.000	N	19.71	20.5	55.7	Compliance
0.181612	32.2	9.000	N	19.65	22.2	54.4	Compliance
0.206306	32.0	9.000	N	19.59	21.4	53.4	Compliance
0.999305	23.2	9.000	N	19.66	22.8	46.0	Compliance
1.023481	24.0	9.000	N	19.66	22.0	46.0	Compliance
1.385415	25.5	9.000	N	19.65	20.5	46.0	Compliance

## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2, then:

–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 2, then:

–compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;  
–non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

30M~200MHz: ±4.7 dB;

200M~1GHz: ±6.0 dB;

1G~6GHz: ±5.13dB;

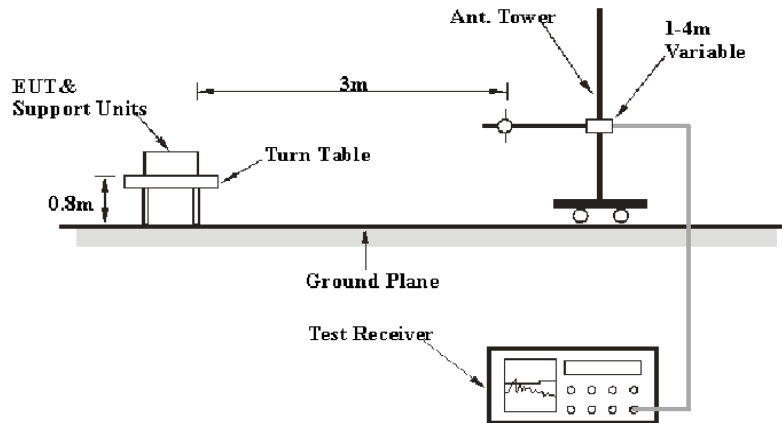
6G~25GHz: ±5.47 dB;

Table 2 – Values of  $U_{cispr}$

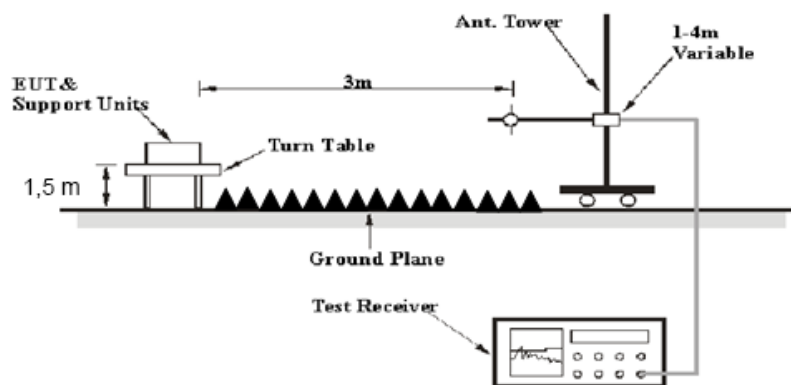
Measurement	$U_{cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

## EUT Setup

### Below 1GHz:



### Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Detector	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Detector	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
ETS	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2015-12-02	2016-12-01
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2015-11-10	2016-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09
WEINSCHL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Rohde & Schwarz	EMC32	N/A	V 8.54.0	N/A	N/A

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25.8 °C
<b>Relative Humidity:</b>	38 %
<b>ATM Pressure:</b>	101.1 kPa

\* The testing was performed by Lorin Bian on 2016-11-04.

*Test Mode: Transmitting*

**30MHz-25GHz:**

802.11b Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	78.46	PK	H	23.50	3.00	0.00	104.96	N/A	N/A
2412	70.67	AV	H	23.50	3.00	0.00	97.17	N/A	N/A
2412	73.93	PK	V	23.50	3.00	0.00	100.43	N/A	N/A
2412	65.73	AV	V	23.50	3.00	0.00	92.23	N/A	N/A
2390	25.98	PK	H	23.57	3.00	0.00	52.55	74.00	21.45
2390	13.87	AV	H	23.57	3.00	0.00	40.44	54.00	13.56
4824	33.02	PK	H	30.84	5.11	26.87	42.10	74.00	31.90
4824	27.16	AV	H	30.84	5.11	26.87	36.24	54.00	17.76
7236	33.25	PK	H	34.77	6.18	26.36	47.84	74.00	26.16
7236	25.96	AV	H	34.77	6.18	26.36	40.55	54.00	13.45
3012	35.03	PK	H	24.27	3.45	26.41	36.34	74.00	37.66
3012	23.44	AV	H	24.27	3.45	26.41	24.75	54.00	29.25
720.64	50.31	QP	V	21.09	2.05	28.65	44.80	46.00	1.20
792.42	48.13	QP	V	21.84	2.30	28.45	43.82	46.00	2.18
Middle Channel: 2437 MHz									
2437	78.47	PK	H	23.41	3.00	0.00	104.88	N/A	N/A
2437	70.46	AV	H	23.41	3.00	0.00	96.87	N/A	N/A
2437	74.78	PK	V	23.41	3.00	0.00	101.19	N/A	N/A
2437	66.67	AV	V	23.41	3.00	0.00	93.08	N/A	N/A
4874	34.15	PK	H	31.00	5.09	26.87	43.37	74.00	30.63
4874	26.54	AV	H	31.00	5.09	26.87	35.76	54.00	18.24
7311	33.87	PK	H	34.92	6.21	26.40	48.60	74.00	25.40
7311	25.14	AV	H	34.92	6.21	26.40	39.87	54.00	14.13
3054	34.21	PK	H	24.50	3.51	26.43	35.79	74.00	38.21
3054	21.03	AV	H	24.50	3.51	26.43	22.61	54.00	31.39
3352	33.85	PK	H	26.17	3.96	26.54	37.44	74.00	36.56
3352	21.25	AV	H	26.17	3.96	26.54	24.84	54.00	29.16
720.64	50.27	QP	V	21.09	2.05	28.65	44.76	46.00	1.24
792.42	47.96	QP	V	21.84	2.30	28.45	43.65	46.00	2.35
High Channel: 2462 MHz									
2462	78.2	PK	H	23.33	2.99	0.00	104.52	N/A	N/A
2462	70.09	AV	H	23.33	2.99	0.00	96.41	N/A	N/A
2462	75.59	PK	V	23.33	2.99	0.00	101.91	N/A	N/A
2462	67.52	AV	V	23.33	2.99	0.00	93.84	N/A	N/A
2483.5	26.24	PK	H	23.26	2.99	0.00	52.49	74.00	21.51
2483.5	14.88	AV	H	23.26	2.99	0.00	41.13	54.00	12.87
4924	33.49	PK	H	31.16	5.07	26.88	42.84	74.00	31.16
4924	25.41	AV	H	31.16	5.07	26.88	34.76	54.00	19.24
7386	33.26	PK	H	35.07	6.25	26.43	48.15	74.00	25.85
7386	24.98	AV	H	35.07	6.25	26.43	39.87	54.00	14.13
3070	33.54	PK	H	24.59	3.54	26.44	35.23	74.00	38.77
3070	21.15	AV	H	24.59	3.54	26.44	22.84	54.00	31.16
720.64	49.87	QP	V	21.09	2.05	28.65	44.36	46.00	1.64
792.42	48.99	QP	V	21.84	2.30	28.45	44.68	46.00	1.32

802.11g Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	77.32	PK	H	23.50	3.00	0.00	103.82	N/A	N/A
2412	63.18	AV	H	23.50	3.00	0.00	89.68	N/A	N/A
2412	72.89	PK	V	23.50	3.00	0.00	99.39	N/A	N/A
2412	58.36	AV	V	23.50	3.00	0.00	84.86	N/A	N/A
2390	42.45	PK	H	23.57	3.00	0.00	69.02	74.00	4.98
2390	15.15	AV	H	23.57	3.00	0.00	41.72	54.00	12.28
4824	33.54	PK	H	30.84	5.11	26.87	42.62	74.00	31.38
4824	20.47	AV	H	30.84	5.11	26.87	29.55	54.00	24.45
7236	33.41	PK	H	34.77	6.18	26.36	48.00	74.00	26.00
7236	21	AV	H	34.77	6.18	26.36	35.59	54.00	18.41
3000	34.79	PK	H	24.20	3.43	26.41	36.01	74.00	37.99
3000	22.55	AV	H	24.20	3.43	26.41	23.77	54.00	30.23
720.64	49.87	QP	V	21.09	2.05	28.65	44.36	46.00	1.64
792.42	47.28	QP	V	21.84	2.30	28.45	42.97	46.00	3.03
Middle Channel: 2437 MHz									
2437	77.75	PK	H	23.41	3.00	0.00	104.16	N/A	N/A
2437	62.95	AV	H	23.41	3.00	0.00	89.36	N/A	N/A
2437	73.38	PK	V	23.41	3.00	0.00	99.79	N/A	N/A
2437	59.16	AV	V	23.41	3.00	0.00	85.57	N/A	N/A
4874	33.73	PK	H	31.00	5.09	26.87	42.95	74.00	31.05
4874	20.71	AV	H	31.00	5.09	26.87	29.93	54.00	24.07
7311	33.63	PK	H	34.92	6.21	26.40	48.36	74.00	25.64
7311	21.18	AV	H	34.92	6.21	26.40	35.91	54.00	18.09
3011	34.99	PK	H	24.26	3.45	26.41	36.29	74.00	37.71
3011	22.77	AV	H	24.26	3.45	26.41	24.07	54.00	29.93
3425	33.86	PK	H	26.58	4.07	26.56	37.95	74.00	36.05
3425	21.46	AV	H	26.58	4.07	26.56	25.55	54.00	28.45
720.64	48.92	QP	V	21.09	2.05	28.65	43.41	46.00	2.59
792.42	47.99	QP	V	21.84	2.30	28.45	43.68	46.00	2.32
High Channel: 2462 MHz									
2462	76.61	PK	H	23.33	2.99	0.00	102.93	N/A	N/A
2462	62.61	AV	H	23.33	2.99	0.00	88.93	N/A	N/A
2462	73.77	PK	V	23.33	2.99	0.00	100.09	N/A	N/A
2462	59.78	AV	V	23.33	2.99	0.00	86.10	N/A	N/A
2483.5	42.74	PK	H	23.26	2.99	0.00	68.99	74.00	5.01
2483.5	18.21	AV	H	23.26	2.99	0.00	44.46	54.00	9.54
4924	33.94	PK	H	31.16	5.07	26.88	43.29	74.00	30.71
4924	20.89	AV	H	31.16	5.07	26.88	30.24	54.00	23.76
7386	33.81	PK	H	35.07	6.25	26.43	48.70	74.00	25.30
7386	21.4	AV	H	35.07	6.25	26.43	36.29	54.00	17.71
3025	35.21	PK	H	24.34	3.47	26.42	36.60	74.00	37.40
3025	22.93	AV	H	24.34	3.47	26.42	24.32	54.00	29.68
720.64	49.25	QP	V	21.09	2.05	28.65	43.74	46.00	2.26
792.42	48.92	QP	V	21.84	2.30	28.45	44.61	46.00	1.39

802.11 n ht20 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	76.22	PK	H	23.50	3.00	0.00	102.72	N/A	N/A
2412	61.77	AV	H	23.50	3.00	0.00	88.27	N/A	N/A
2412	70.71	PK	V	23.50	3.00	0.00	97.21	N/A	N/A
2412	56.38	AV	V	23.50	3.00	0.00	82.88	N/A	N/A
2390	39.53	PK	H	23.57	3.00	0.00	66.10	74.00	7.90
2390	14.73	AV	H	23.57	3.00	0.00	41.30	54.00	12.70
4824	34.32	PK	H	30.84	5.11	26.87	43.40	74.00	30.60
4824	21.2	AV	H	30.84	5.11	26.87	30.28	54.00	23.72
7236	34.17	PK	H	34.77	6.18	26.36	48.76	74.00	25.24
7236	21.79	AV	H	34.77	6.18	26.36	36.38	54.00	17.62
3021	35.53	PK	H	24.32	3.46	26.42	36.89	74.00	37.11
3021	23.29	AV	H	24.32	3.46	26.42	24.65	54.00	29.35
720.64	48.77	QP	V	21.09	2.05	28.65	43.26	46.00	2.74
792.42	47.28	QP	V	21.84	2.30	28.45	42.97	46.00	3.03
Middle Channel: 2437 MHz									
2437	75.78	PK	H	23.41	3.00	0.00	102.19	N/A	N/A
2437	61.74	AV	H	23.41	3.00	0.00	88.15	N/A	N/A
2437	71.39	PK	V	23.41	3.00	0.00	97.80	N/A	N/A
2437	57.45	AV	V	23.41	3.00	0.00	83.86	N/A	N/A
4874	34.14	PK	H	31.00	5.09	26.87	43.36	74.00	30.64
4874	21.09	AV	H	31.00	5.09	26.87	30.31	54.00	23.69
7311	34.03	PK	H	34.92	6.21	26.40	48.76	74.00	25.24
7311	21.62	AV	H	34.92	6.21	26.40	36.35	54.00	17.65
3310	35.43	PK	H	25.94	3.90	26.52	38.75	74.00	35.25
3310	23.13	AV	H	25.94	3.90	26.52	26.45	54.00	27.55
3610	34.28	PK	H	27.44	4.34	26.58	39.48	74.00	34.52
3610	21.83	AV	H	27.44	4.34	26.58	27.03	54.00	26.97
720.64	48.74	QP	V	21.09	2.05	28.65	43.23	46.00	2.77
792.42	47.29	QP	V	21.84	2.30	28.45	42.98	46.00	3.02
High Channel: 2462 MHz									
2462	75.29	PK	H	23.33	2.99	0.00	101.61	N/A	N/A
2462	61.39	AV	H	23.33	2.99	0.00	87.71	N/A	N/A
2462	71.95	PK	V	23.33	2.99	0.00	98.27	N/A	N/A
2462	58.33	AV	V	23.33	2.99	0.00	84.65	N/A	N/A
2483.5	43.12	PK	H	23.26	2.99	0.00	69.37	74.00	4.63
2483.5	17.74	AV	H	23.26	2.99	0.00	43.99	54.00	10.01
4924	34.39	PK	H	31.16	5.07	26.88	43.74	74.00	30.26
4924	21.43	AV	H	31.16	5.07	26.88	30.78	54.00	23.22
7386	34.36	PK	H	35.07	6.25	26.43	49.25	74.00	24.75
7386	21.97	AV	H	35.07	6.25	26.43	36.86	54.00	17.14
3024	35.7	PK	H	24.33	3.47	26.42	37.08	74.00	36.92
3024	23.46	AV	H	24.33	3.47	26.42	24.84	54.00	29.16
720.64	48.22	QP	V	21.09	2.05	28.65	42.71	46.00	3.29
792.42	47.58	QP	V	21.84	2.30	28.45	43.27	46.00	2.73



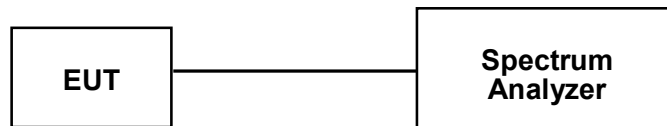
## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

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.

### Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	25.8 °C
Relative Humidity:	38 %
ATM Pressure:	101.1 kPa

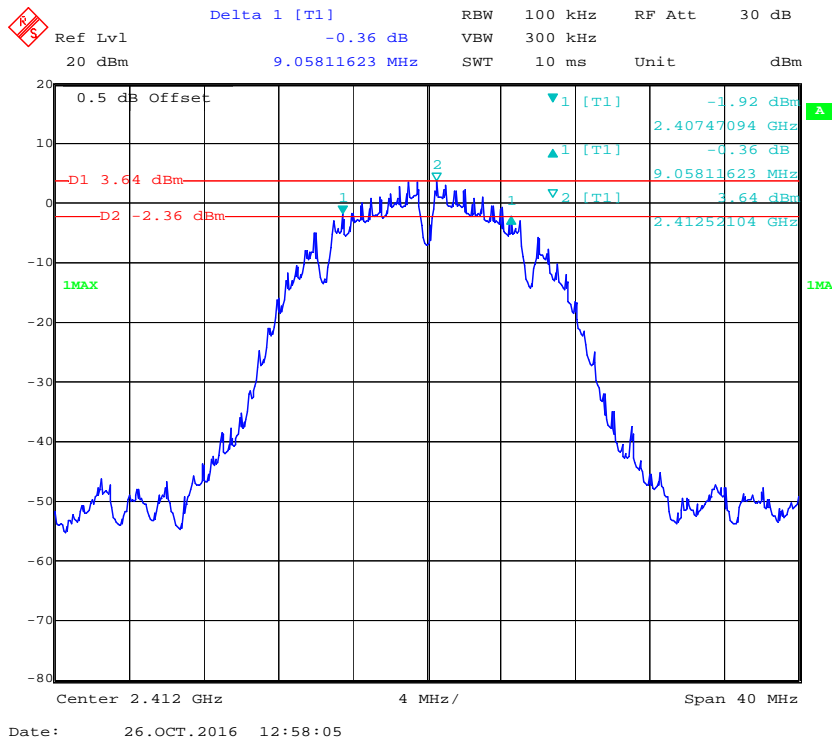
\* The testing was performed by Lorin Bian on 2016-10-26.

Test Mode: Transmitting

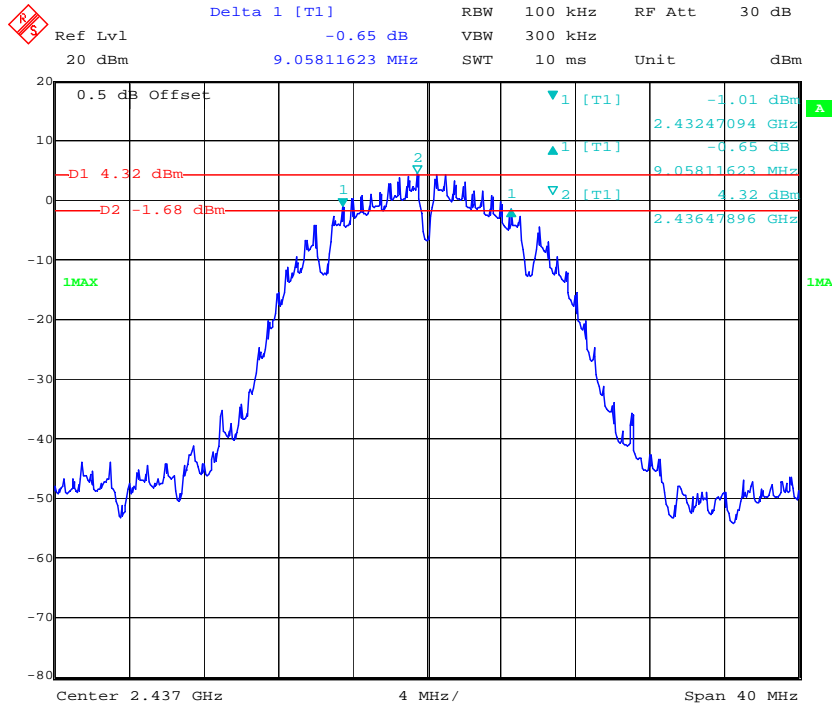
Test Result: Compliant. Please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	9.06	≥0.5
	Middle	2437	9.06	≥0.5
	High	2462	9.54	≥0.5
802.11g	Low	2412	15.55	≥0.5
	Middle	2437	15.63	≥0.5
	High	2462	15.87	≥0.5
802.11n20	Low	2412	16.43	≥0.5
	Middle	2437	16.67	≥0.5
	High	2462	16.59	≥0.5

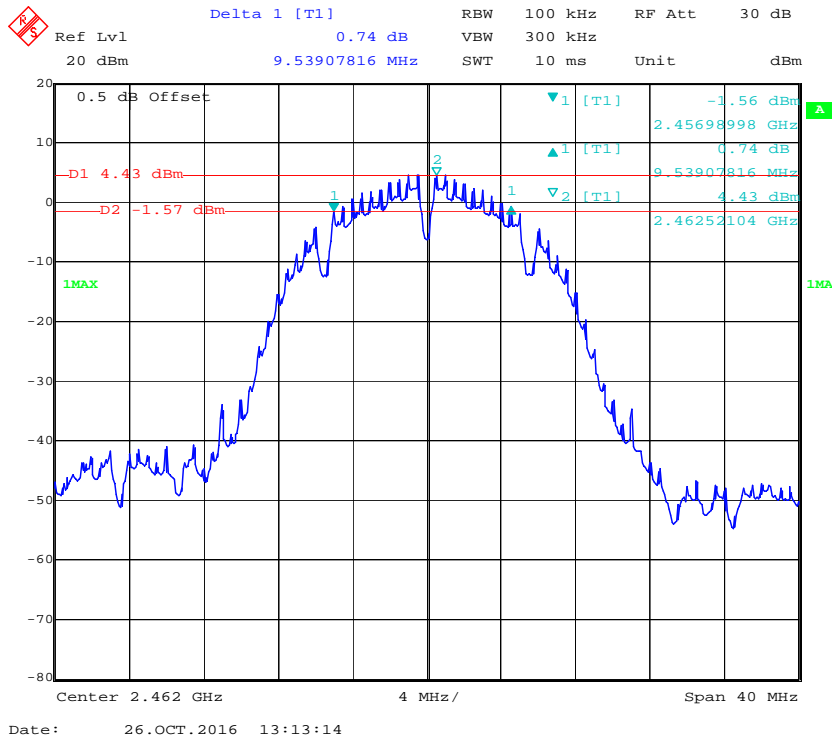
802.11b Low Channel



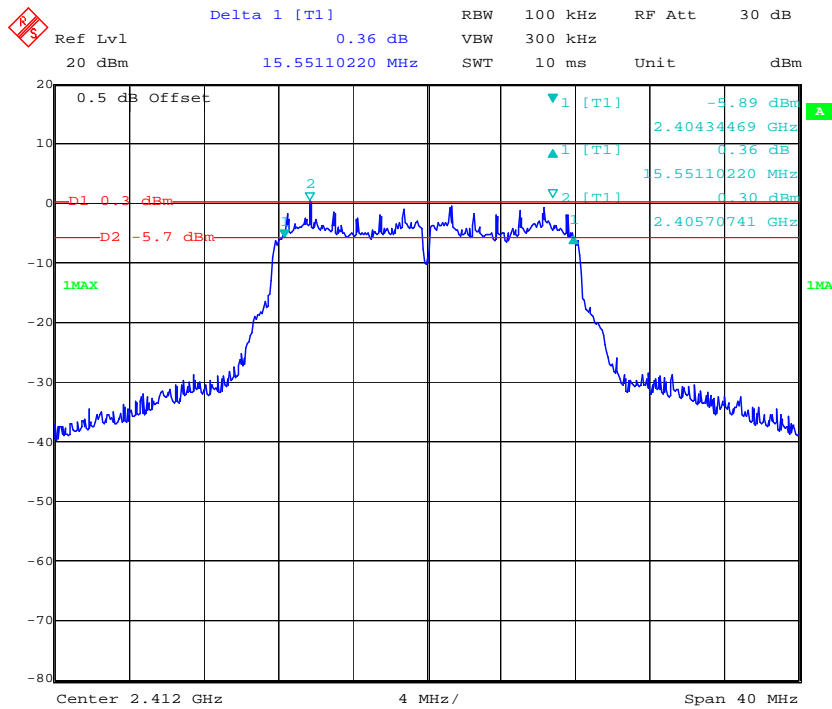
802.11b Middle Channel



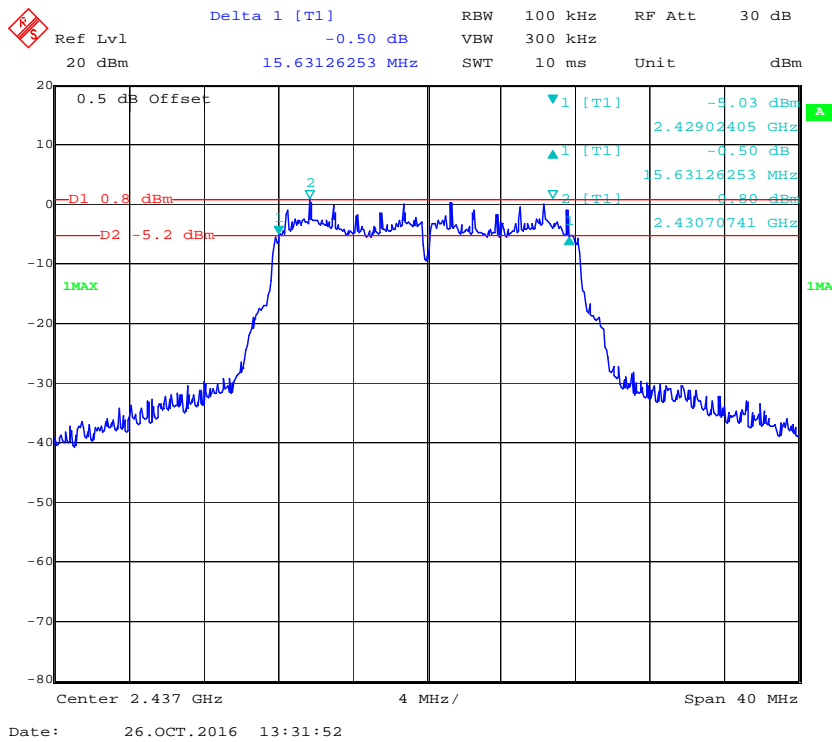
802.11b High Channel



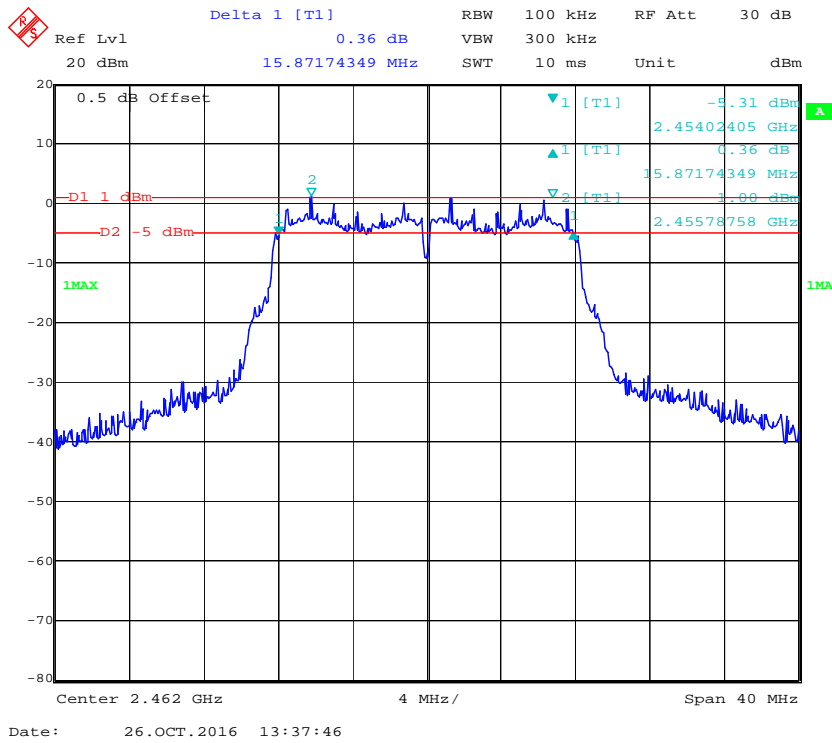
### 802.11g Low Channel



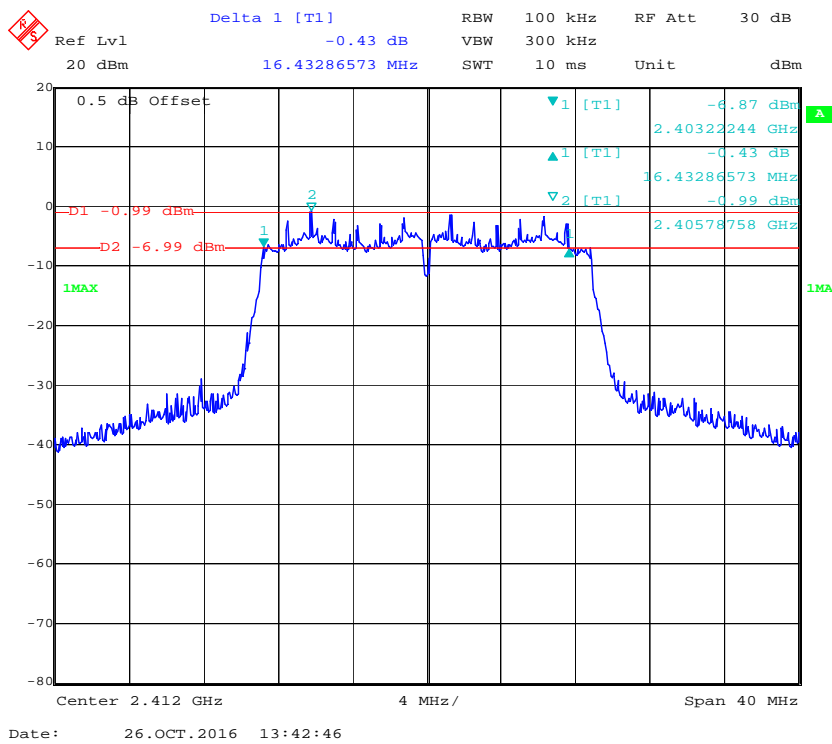
### 802.11g Middle Channel



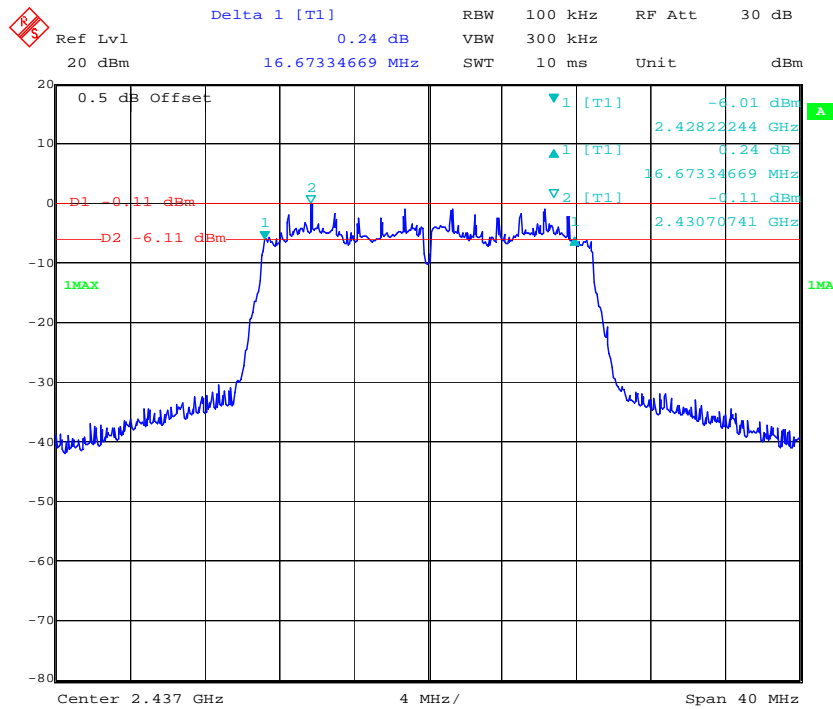
### 802.11g High Channel



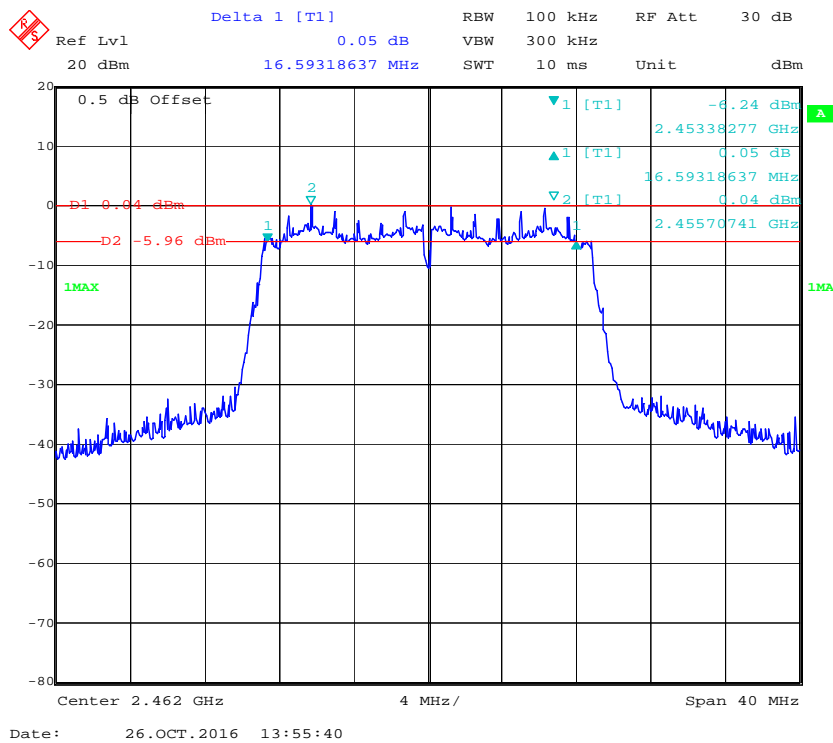
### 802.11n ht20 Low Channel



### 802.11n ht20 Middle Channel



### 802.11n ht20 High Channel



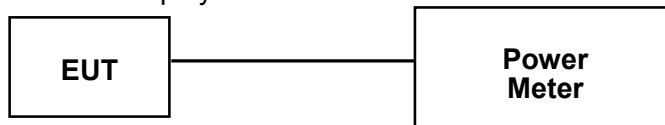
## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

According to FCC §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. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170074	2016-01-03	2017-01-03
Agilent	P-Series Power Meter	N1912A	MY5000798	2016-01-03	2017-01-03
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25.8 °C
<b>Relative Humidity:</b>	38 %
<b>ATM Pressure:</b>	101.1 kPa

\* The testing was performed by Lorin Bian on 2016-10-26.

*Test Mode: Transmitting*

*Test Result: Compliant. Please refer to the following table.*

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Max Average Conducted Output Power (dBm)	Limit (dBm)
802.11b	Low	2412	15.75	13.13	30
	Middle	2437	16.45	13.49	30
	High	2462	16.24	13.33	30
802.11g	Low	2412	17.08	12.53	30
	Middle	2437	17.82	13.16	30
	High	2462	18.13	13.22	30
802.11n20	Low	2412	16.03	11.44	30
	Middle	2437	16.76	12.17	30
	High	2462	17.05	12.38	30

*Note: Duty cycle factor 0.27dB(94% duty cycle) for 802.11g and n20 mode was added in the result according to KDB 558074§9.2.3.1.*



## **FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**

### **Applicable Standard**

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)).

### **Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BAAC (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data**

**Environmental Conditions**

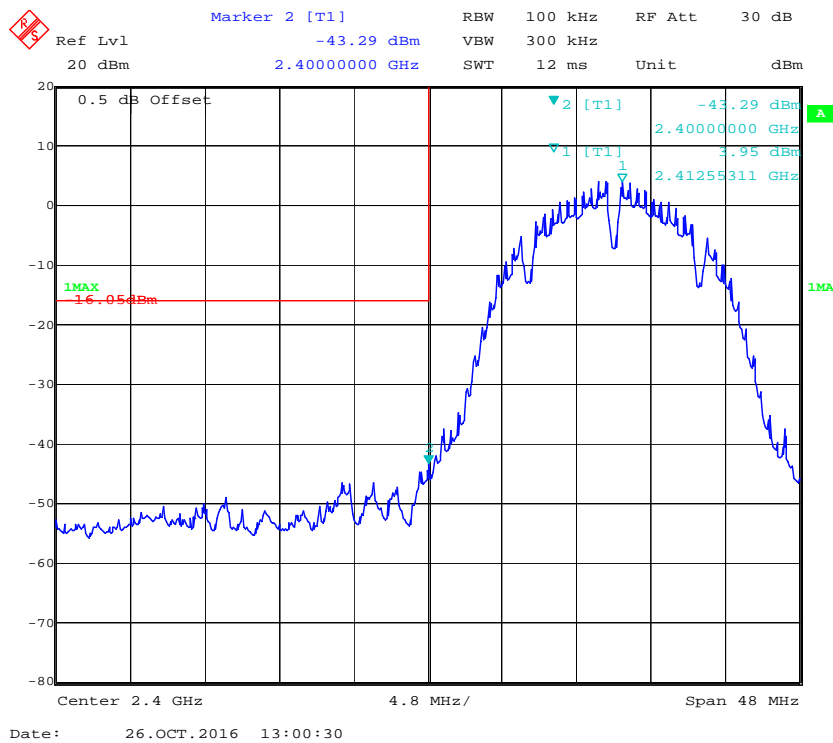
<b>Temperature:</b>	25.8 °C
<b>Relative Humidity:</b>	38 %
<b>ATM Pressure:</b>	101.1 kPa

\* The testing was performed by Lorin Bian on 2016-10-26.

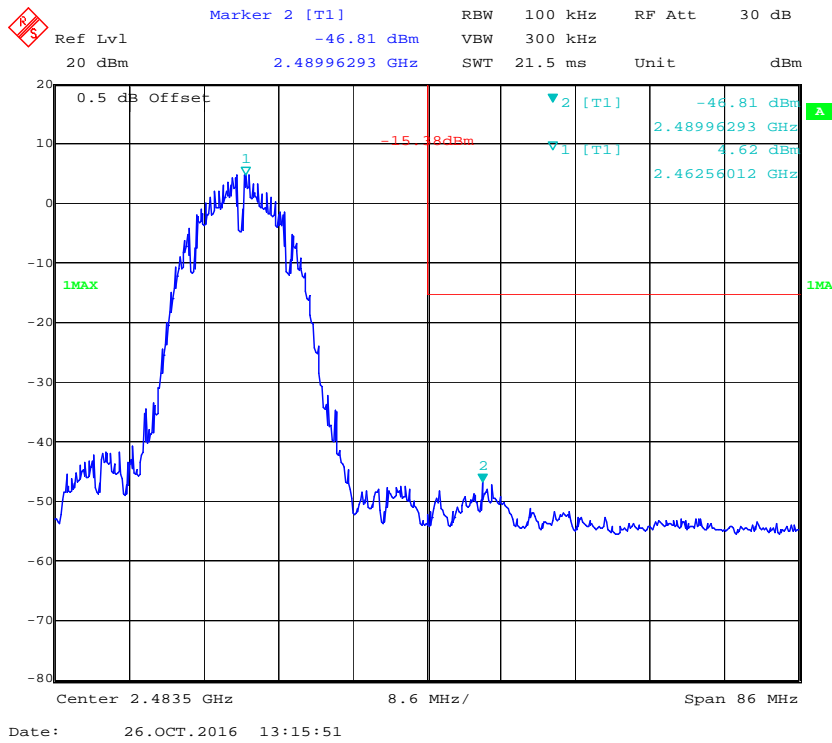
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

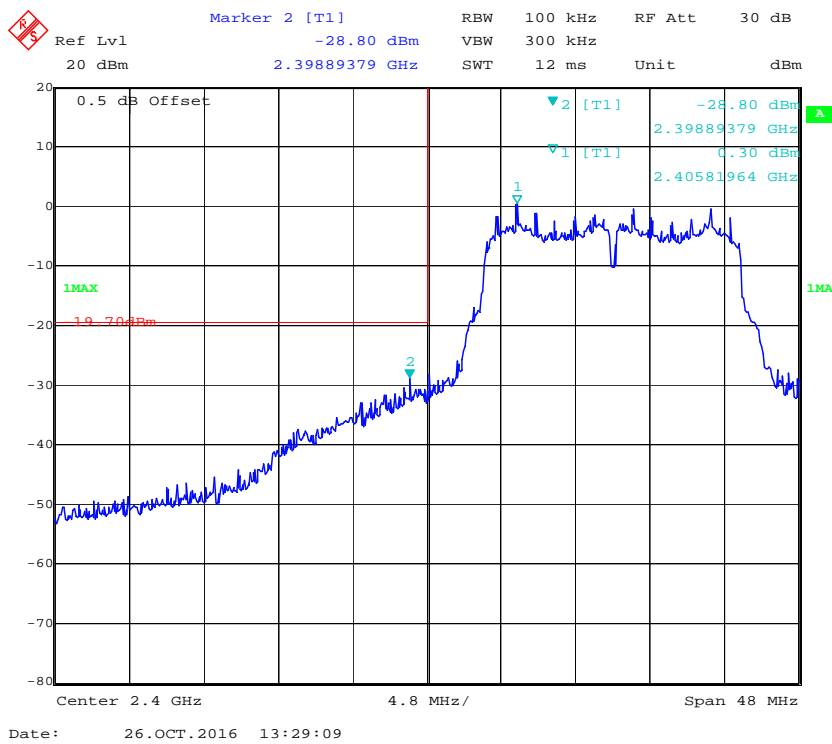
**802.11b: Band Edge, Left Side**



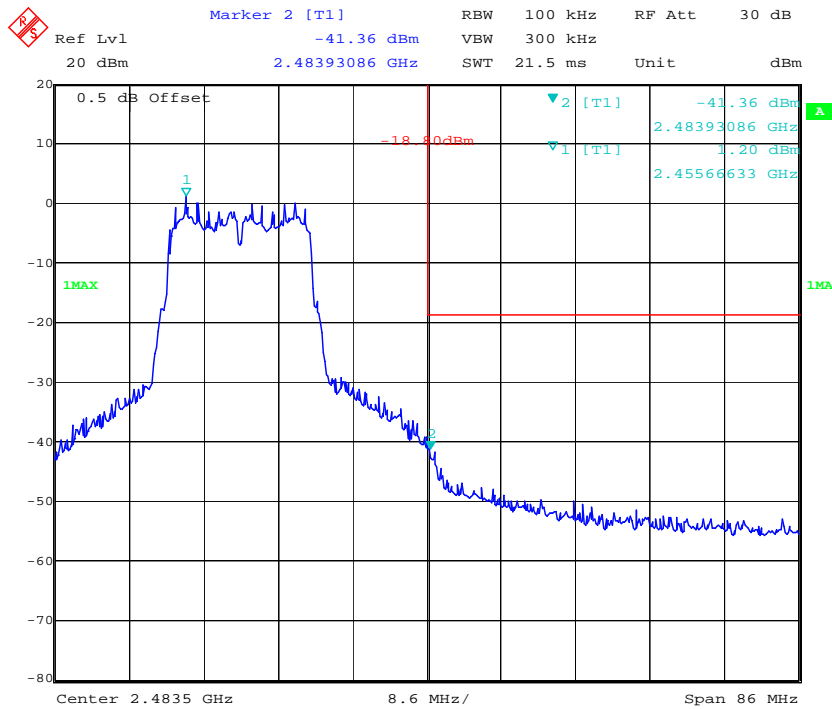
### 802.11b: Band Edge, Right Side



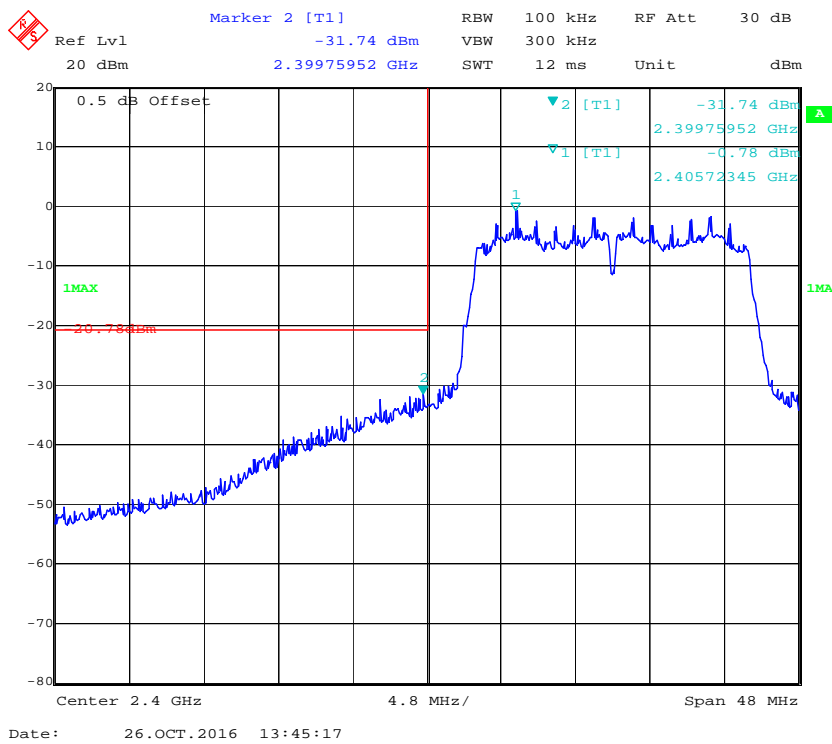
### 802.11g: Band Edge, Left Side



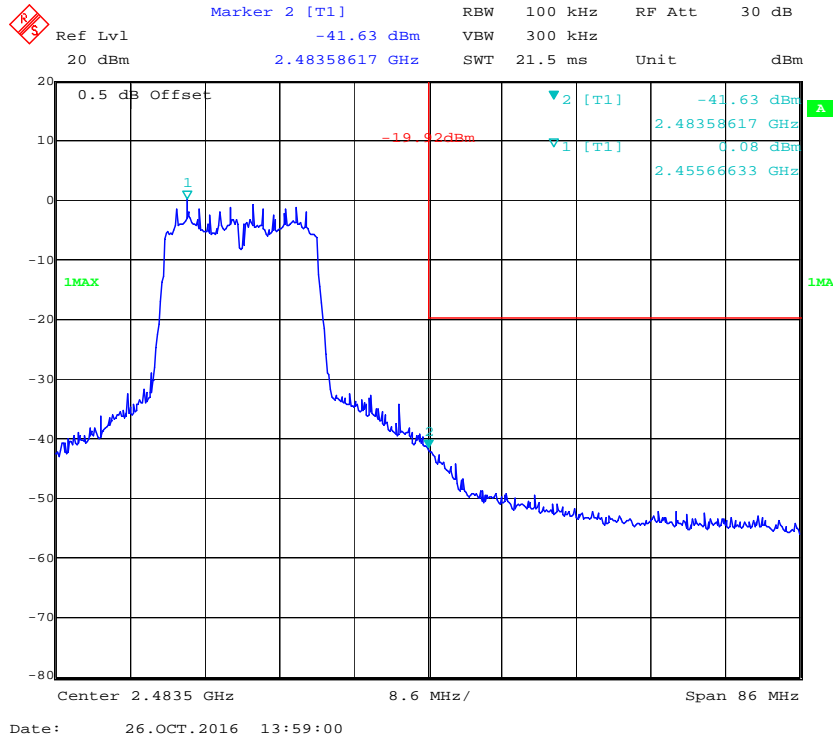
### 802.11g: Band Edge, Right Side



### 802.11n ht20 Band Edge, Left Side



### 802.11n ht20 Band Edge, Right Side



## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Procedure

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	25.8 °C
Relative Humidity:	38 %
ATM Pressure:	101.1 kPa

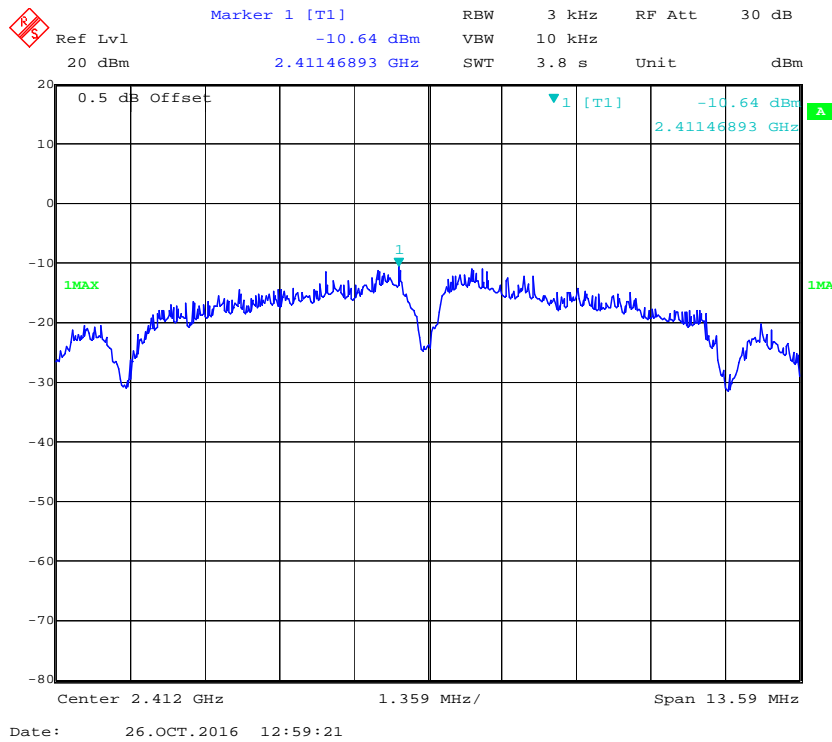
\* The testing was performed by Lorin Bian on 2016-10-26.

Test Mode: Transmitting

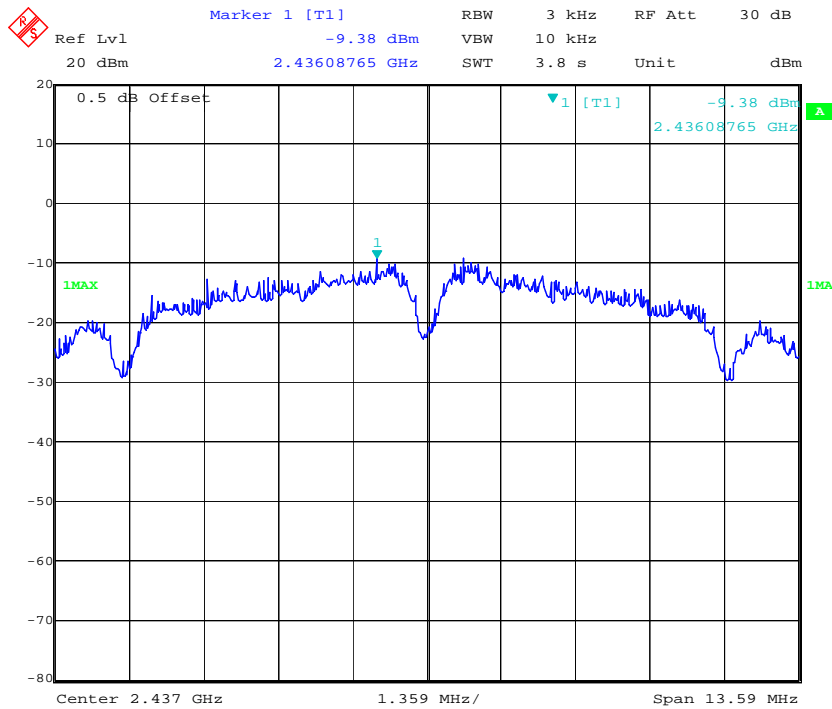
Test Result: Compliant. Please refer to the following table and plots

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-10.64	≤8
	Middle	2437	-9.38	≤8
	High	2462	-8.55	≤8
802.11g	Low	2412	-14.84	≤8
	Middle	2437	-14.28	≤8
	High	2462	-13.96	≤8
802.11n20	Low	2412	-15.52	≤8
	Middle	2437	-15.26	≤8
	High	2462	-14.98	≤8

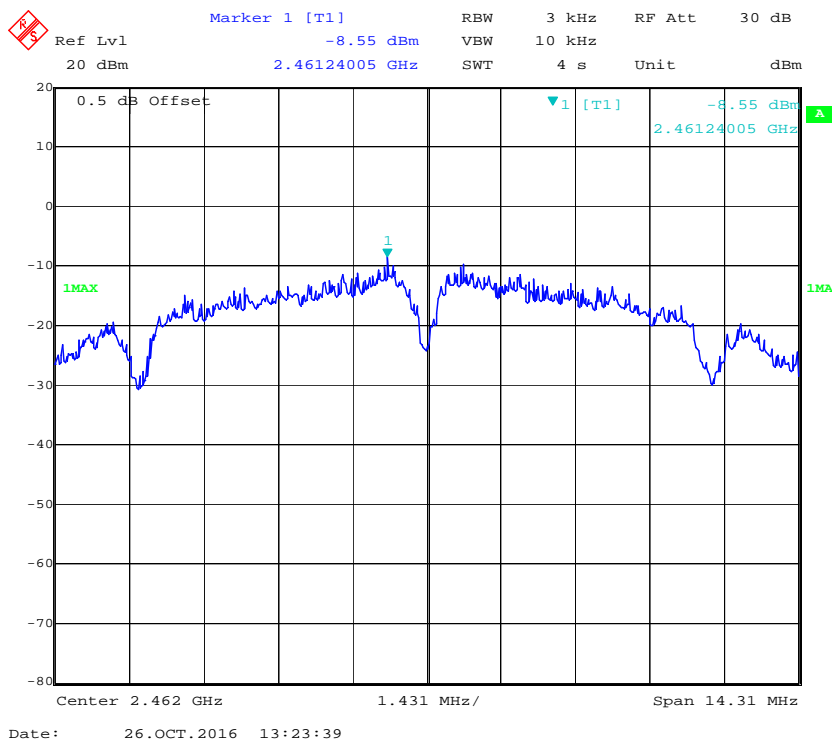
**Power Spectral Density, 802.11b Low Channel**



### Power Spectral Density, 802.11b Middle Channel

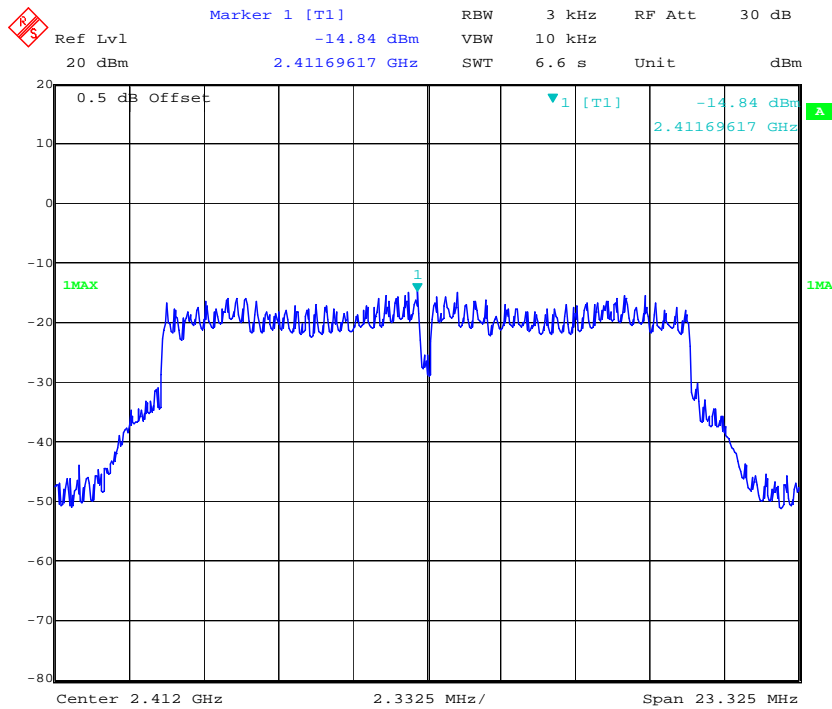


### Power Spectral Density, 802.11b High Channel

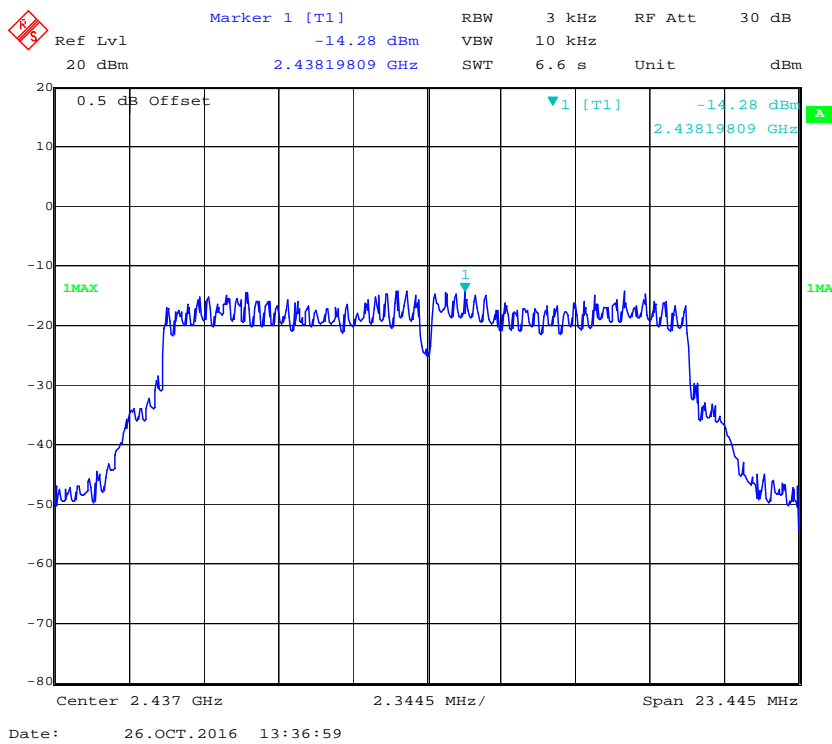




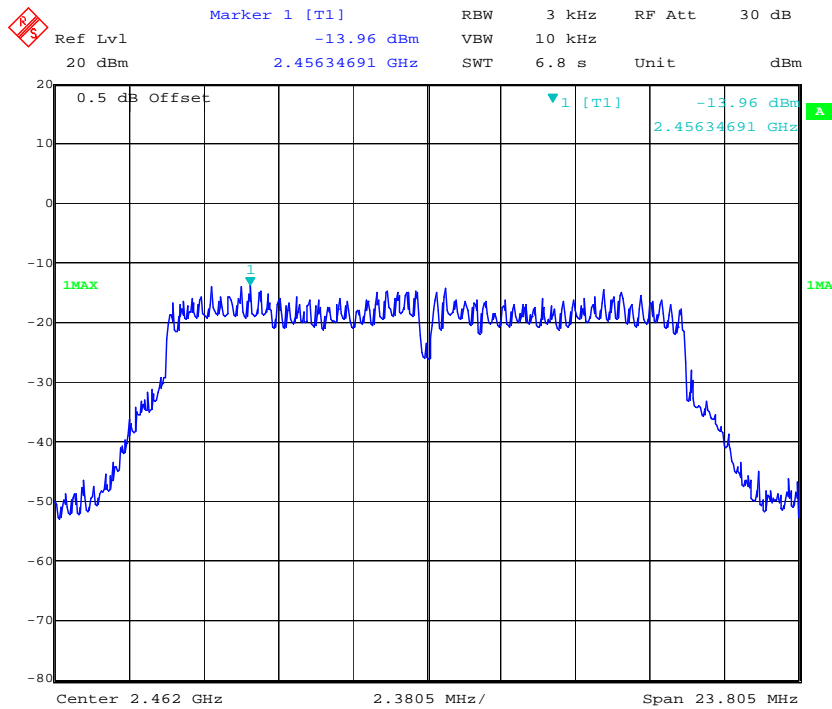
### Power Spectral Density, 802.11g Low Channel



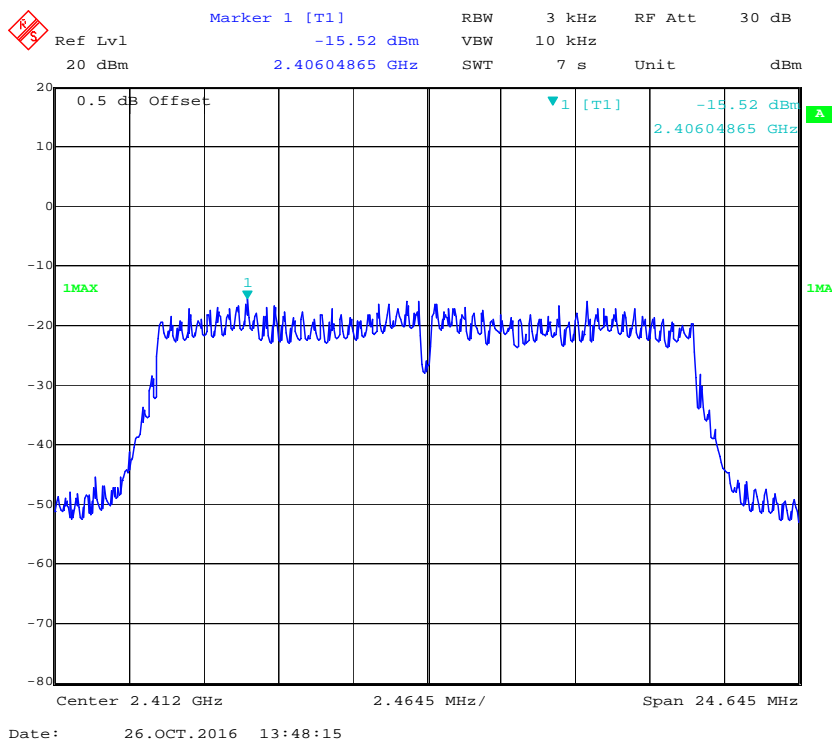
### Power Spectral Density, 802.11g Middle Channel



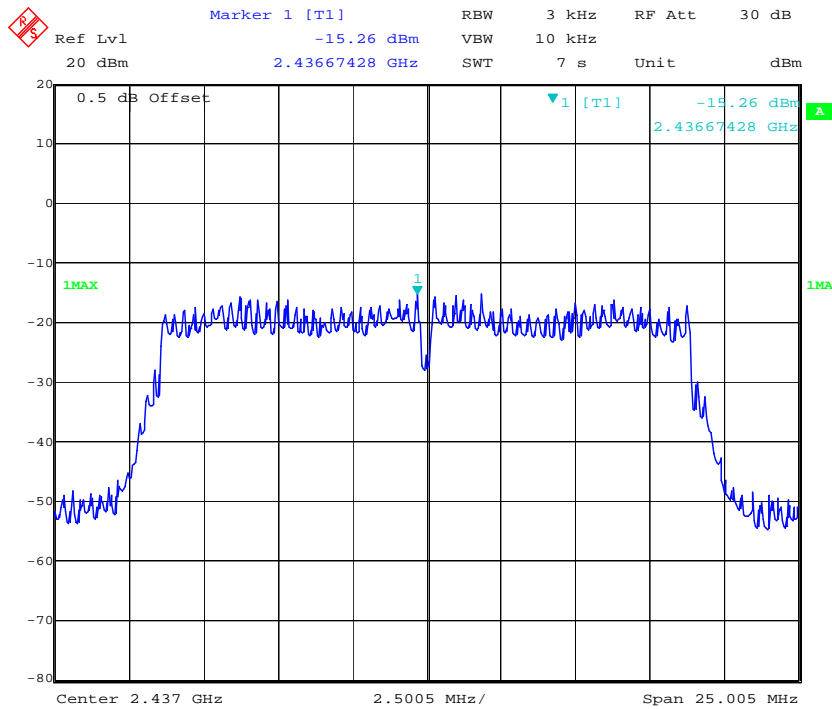
### Power Spectral Density, 802.11g High Channel



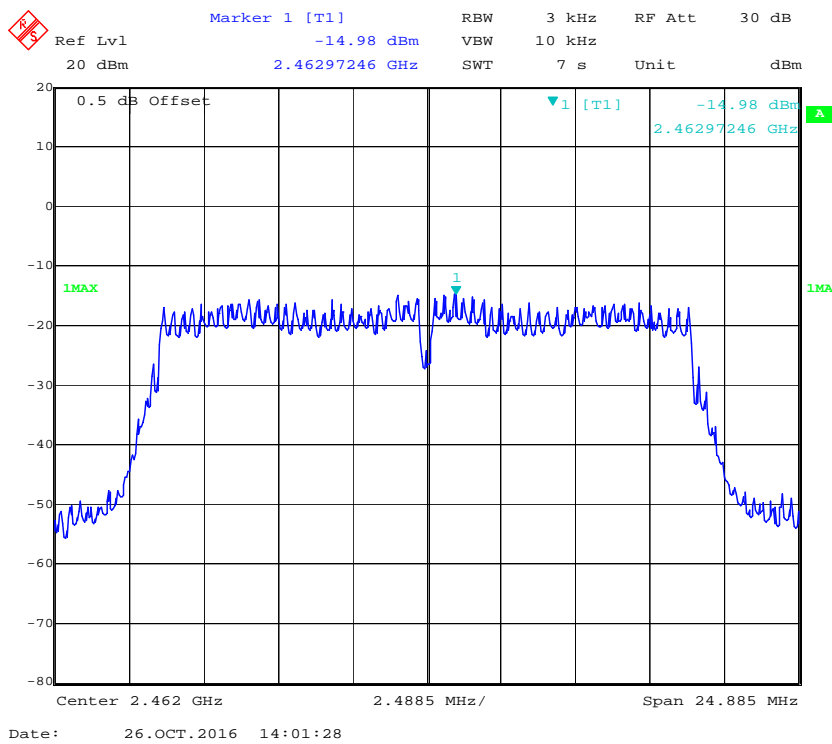
### Power Spectral Density, 802.11n ht20 Low Channel



### Power Spectral Density, 802.11n ht20 Middle Channel



### Power Spectral Density, 802.11n ht20 High Channel



\*\*\*\*\* END OF REPORT \*\*\*\*\*